

## **APPENDIX A**

**Field Study**

**Vicinity Map**

**Regional Geology Map**

**Site Plans**

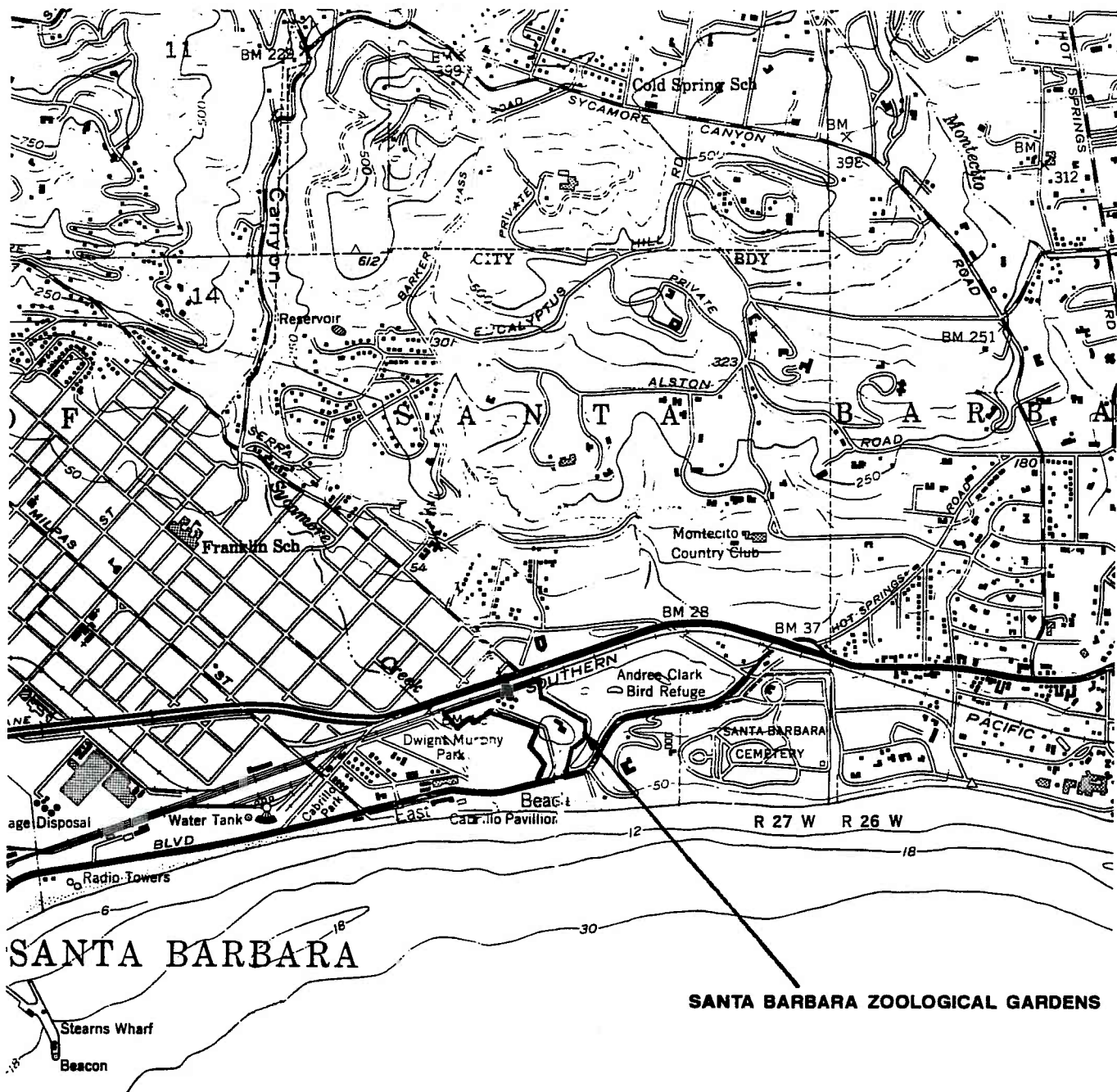
**Boring Logs**

**Symbols Commonly Used on Boring Logs**

**Unified Soil Classification**

## FIELD STUDY

- A. On October 31, 2001, 8 borings were hand augered using a subcontracted hand excavating crew to observe the soil profile and to obtain samples for laboratory analysis. The maximum depth explored was approximately 10.5 feet below the existing ground surface. The approximate locations of the test borings were determined in the field by pacing and sighting, and are shown on the Site Plan in this Appendix.
- B. Samples were obtained within the test borings with a Modified California (M.C.) ring sampler (ASTM D 3550 with shoe similar to ASTM D 1586). The M.C. sampler has a 3.00-inch outside diameter and a 2.37-inch inside diameter. The samples were obtained within the hand augered borings with a lightweight hand operated slide hammer.
- C. Bulk samples of the soils encountered were gathered from the auger cuttings.
- D. The final logs of the borings represent our interpretation of the contents of the field logs and the results of laboratory testing performed on the samples obtained during the subsurface study. The final logs are included in this Appendix.



SANTA BARBARA

SANTA BARBARA ZOOLOGICAL GARDENS

SCALE

1" = 2,000'

NORTH

\* Taken from USGS 7.5' Santa Barbara Quadrangle



EARTH SYSTEMS SOUTHERN CALIFORNIA

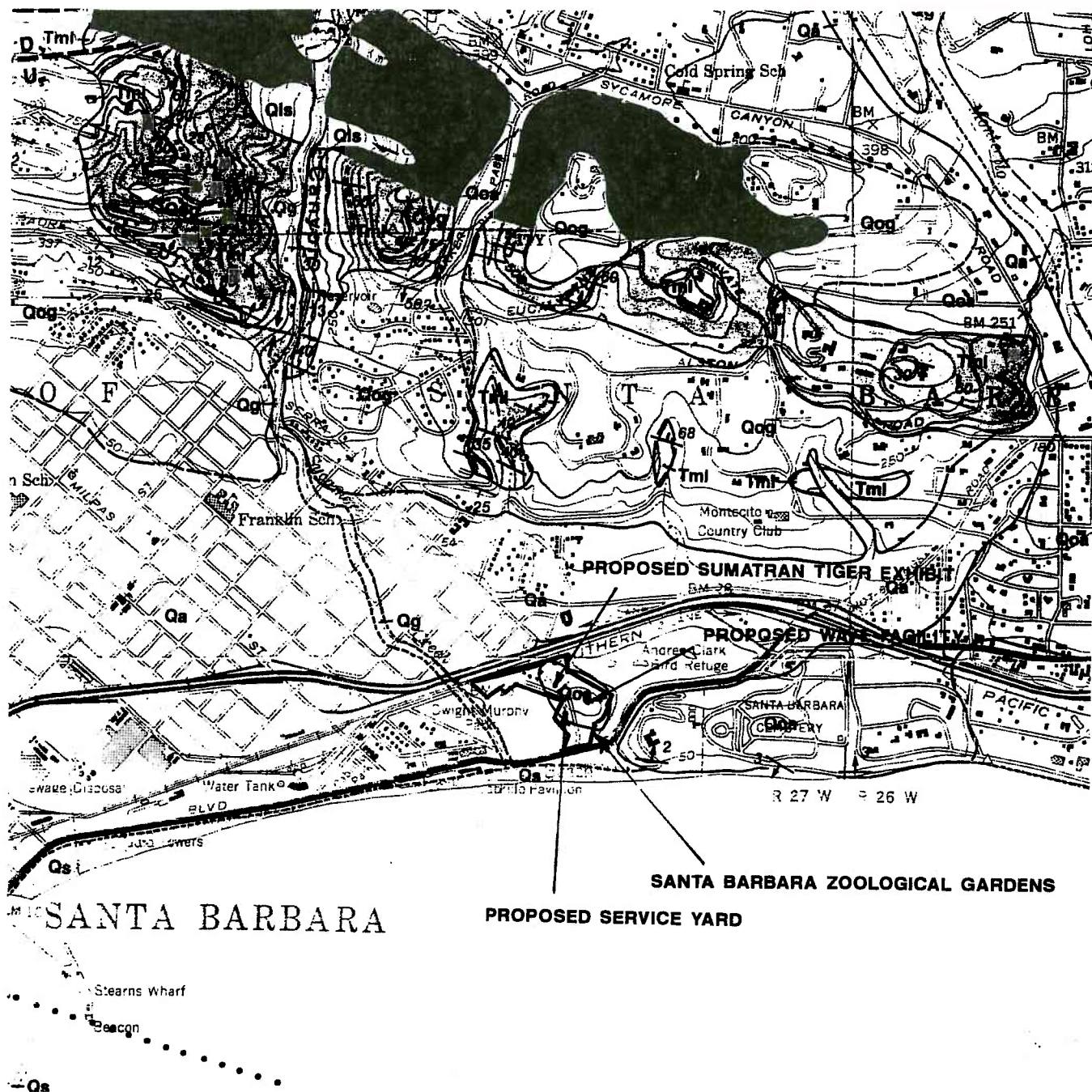
1731-A Walter Street, Ventura, California 93003  
PH: (805) 642-6727 FAX: (805) 642-1325

VICINITY MAP \*

Santa Barbara Zoological Gardens  
Santa Barbara, California

July 2001 Job No. VT-22503-01





1" = 2,000'

NORTH

\* Taken from Thomas W. Dibblee, Geologic Map of the Santa Barbara Quadrangle, 1986



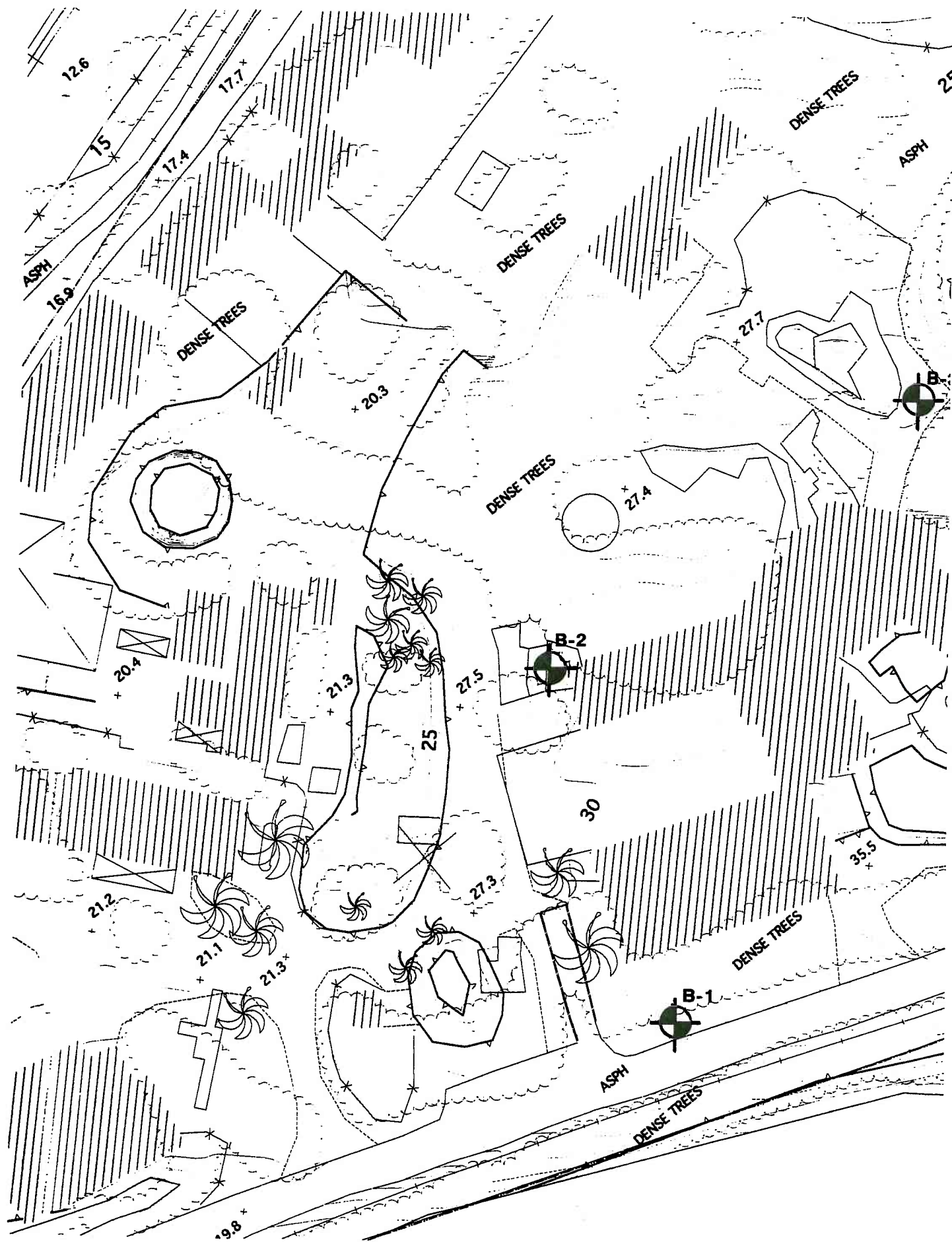
EARTH SYTEMS SOUTHERN CALIFORNIA

1731-A Walter Street, Ventura, California 93003  
PH: (805) 642-6727 FAX: (805) 642-1325

REGIONAL GEOLOGY \*

Santa Barbara Zoological Gradens  
Santa Barbara, California

December 2001 Job No. VT-22503-02

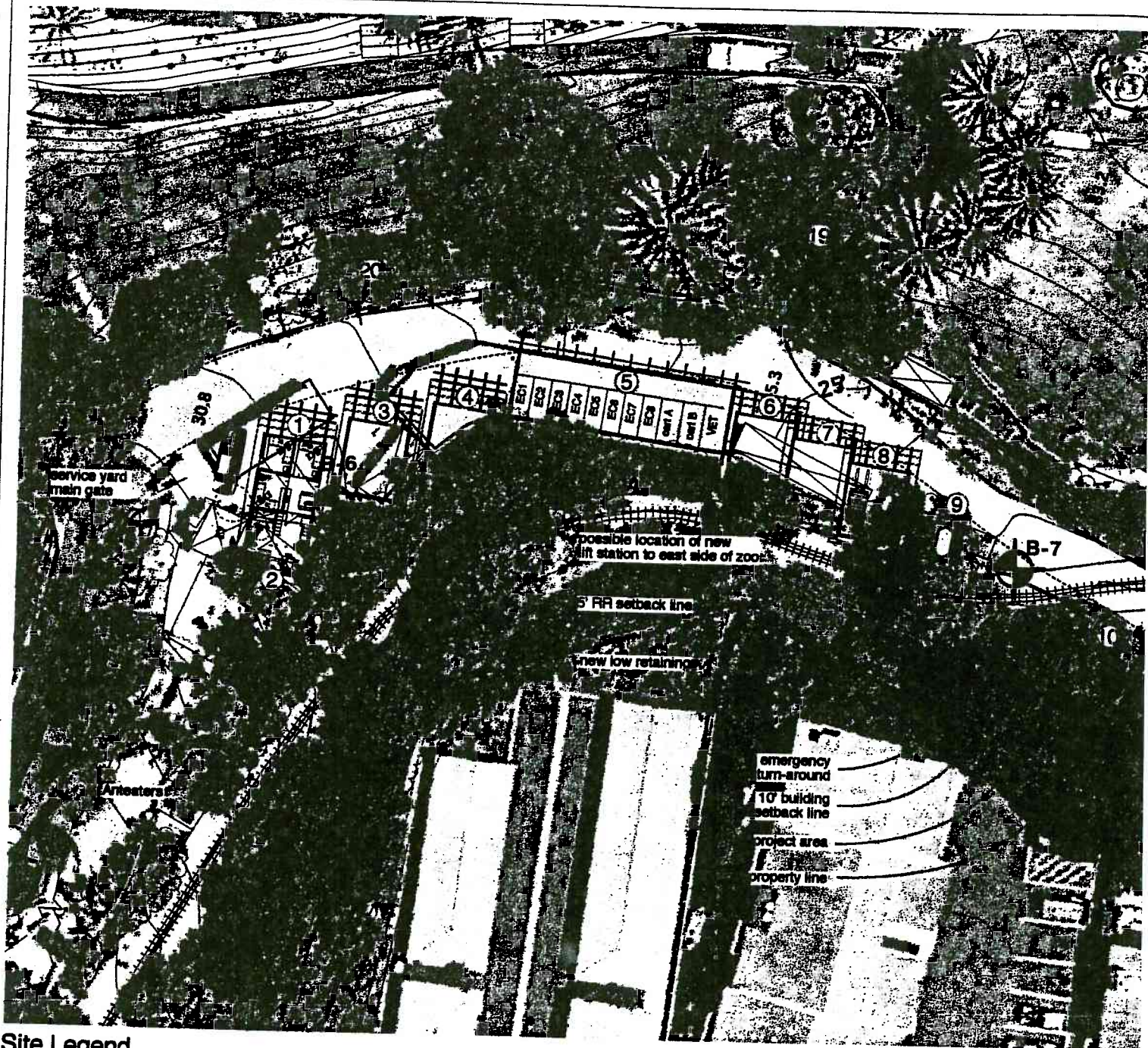






APN 017-382-02





## Site Legend

| Space name   | Dimensions     | ASF        | Building materials   | Comments  |
|--|----------------|------------|--|---|
| 1 offices  | 16' x 20'      | 320 SF     | slab-on-grade, wood stud framing, TJI rafters,                 | partitions, furniture, computers, communications  |
| 2 employee break/restroom                                    | 16' x 16'      | 256 SF     | metal roof, wood exterior, exposed interior                    | furniture, kitchenette, lockers, ADA restroom, eye wash station                                       |
| 3 wood shop  | 16' x 20'      | 320 SF     | same as above  | requires cabinetry, shelving, exhaust system  |
| 4 metal shop/train repair                                    | 16' x 20'      | 320 SF     | same as above  |   |
| 5 existing hay barn/ zoo cart storage                        | 16' x 55'      | (E) 880 SF | none   | cabinetry, shelving, exhaust system, beam hoist, propane storage                                      |
| 6 general maintenance/ construction/ hardware/ paint storage | 16' x 20'      | 320 SF     | same as above  | point exterior, new charging stations for carts, hose bib & sink                                      |
| 7 grounds maintenance/ small equip/ tools                    | 16' x 20'      | 320 SF     | same as above  | forklift accessible, shelving   |
| 8 janitorial/ restaurant/ giftshop storage                   | 16' x 20'      | 320 SF     | same as above  | forklift accessible, shelving   |
| 9 relocated fuel storage                                     | 10' x 10'      | 320 SF     | slab-on-grade, containment pan, metal shed roof                | special containment pan   |
| 10 zoo camp/education/docent storage                         | 16' x 20'      | 320 SF     | same as above  | flexible space for office/storage, forklift accessible  |
| 11 keeper/vet storage  | 16' x 20'      | 320 SF     | same as above  | forklift accessible   |
| 12 lath trellis  | 25' x 50'      | 1250 SF    | concrete footings, wood posts and beams, Nexwood cross members | hose bibs, irrigation, gravel floor   |
| 13 green waste container                                     | 8' x 20'       | 160 SF     | slab-on-grade, split-face CMU                                  | access for delivery truck   |
| 14 5 bulk material bays                                      | (x5) 10' x 15' | 750 SF     | slab-on-grade, split-face CMU                                  | access for delivery trucks, skip loader   |
| 15 new drainage work   | —              | —          | site work, study in progress by Flowers & Assoc.               | re-grade, concrete gutter, bio-wales, retention pond  |
| 16 backflow device screening                                 | —              | —          | planting   |   |
| 17 new automatic gate and wall                               | 15'0"          | —          | 'Estate style' masonry wall, wrought iron gate                 | new plantings around backflow device  |
| 18 existing fire hydrant                                     | —              | —          | none   | visually screening security gate with 40' clear zone to serve service yard and Cats of Africa exhibit |
| 19 fire access road  | —              | —          | paving   |   |
| 20 storage canopy's  | 6' x 20'       | —          | Galv. metal awnings, canvas or equivalent material             | re-surface, relocate gate and fence for minimum 12' width   |

Total proposed project building square feet:

5076 SF



**BORING NO:** 1  
**PROJECT NAME:** Santa Barbara Zoological Gardens  
**PROJECT NUMBER:** VT-22503-02  
**BORING LOCATION:** Per Plan

**DRILLING DATE:** 10-31-01  
**DRILLING METHOD:** Hand Auger  
**DRILL:** Mike's Excavating  
**LOGGED BY:** K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|----------------------|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |                      |
| 0                        |                |     |             |   |        |            |                       |                         |                      |
| 1                        |                |     |             |   |        |            |                       |                         |                      |
| 2                        |                |     |             |   |        |            |                       |                         |                      |
| 3                        |                |     |             |   |        |            |                       |                         |                      |
| 4                        |                |     |             |   |        |            |                       |                         |                      |
| 5                        |                |     |             |   |        |            |                       |                         |                      |
| 6                        |                |     |             |   |        |            |                       |                         |                      |
| 7                        |                |     |             |   |        |            |                       |                         |                      |
| 8                        |                |     |             |   |        |            |                       |                         |                      |
| 9                        |                |     |             |   |        |            |                       |                         |                      |
| 10                       |                |     |             |   |        |            |                       |                         |                      |
| 11                       |                |     |             |   |        |            |                       |                         |                      |
| 12                       |                |     |             |   |        |            |                       |                         |                      |
| 13                       |                |     |             |   |        |            |                       |                         |                      |
| 14                       |                |     |             |   |        |            |                       |                         |                      |
| 15                       |                |     |             |   |        |            |                       |                         |                      |
| 16                       |                |     |             |   |        |            |                       |                         |                      |
| 17                       |                |     |             |   |        |            |                       |                         |                      |
| 18                       |                |     |             |   |        |            |                       |                         |                      |
| 19                       |                |     |             |   |        |            |                       |                         |                      |
| 20                       |                |     |             |   |        |            |                       |                         |                      |
| 21                       |                |     |             |   |        |            |                       |                         |                      |
| 22                       |                |     |             |   |        |            |                       |                         |                      |
| 23                       |                |     |             |   |        |            |                       |                         |                      |
| 24                       |                |     |             |   |        |            |                       |                         |                      |
| 25                       |                |     |             |   |        |            |                       |                         |                      |
| 26                       |                |     |             |   |        |            |                       |                         |                      |
| 27                       |                |     |             |   |        |            |                       |                         |                      |
| 28                       |                |     |             |   |        |            |                       |                         |                      |
| 29                       |                |     |             |   |        |            |                       |                         |                      |
| 30                       |                |     |             |   |        |            |                       |                         |                      |
| 31                       |                |     |             |   |        |            |                       |                         |                      |
| 32                       |                |     |             |   |        |            |                       |                         |                      |
| 33                       |                |     |             |   |        |            |                       |                         |                      |
| 34                       |                |     |             |   |        |            |                       |                         |                      |
| 35                       |                |     |             |   |        |            |                       |                         |                      |
| 36                       |                |     |             |   |        |            |                       |                         |                      |
| 37                       |                |     |             |   |        |            |                       |                         |                      |
| 38                       |                |     |             |   |        |            |                       |                         |                      |
| 39                       |                |     |             |   |        |            |                       |                         |                      |
| 40                       |                |     |             |   |        |            |                       |                         |                      |

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.





BORING NO: 2

PROJECT NAME: Santa Barbara Zoological Gardens

PROJECT NUMBER: VT-22503-02

BORING LOCATION: Per Plan

DRILLING DATE: 10-31-01

DRILLING METHOD: Hand Auger

DRILL: Mike's Excavating

LOGGED BY: K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|----------------------|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |                      |
| 0                        |                |     |             |   |        |            |                       |                         |                      |
| 1                        |                |     |             |   |        |            |                       |                         |                      |
| 2                        |                |     |             |   |        |            |                       |                         |                      |
| 3                        |                |     |             |   |        |            |                       |                         |                      |
| 4                        |                |     |             |   |        |            |                       |                         |                      |
| 5                        |                |     |             |   |        |            |                       |                         |                      |
| 6                        |                |     |             |   |        |            |                       |                         |                      |
| 7                        |                |     |             |   |        |            |                       |                         |                      |
| 8                        |                |     |             |   |        |            |                       |                         |                      |
| 9                        |                |     |             |   |        |            |                       |                         |                      |
| 10                       |                |     |             |   |        |            |                       |                         |                      |
| 11                       |                |     |             |   |        |            |                       |                         |                      |
| 12                       |                |     |             |   |        |            |                       |                         |                      |
| 13                       |                |     |             |   |        |            |                       |                         |                      |
| 14                       |                |     |             |   |        |            |                       |                         |                      |
| 15                       |                |     |             |   |        |            |                       |                         |                      |
| 16                       |                |     |             |   |        |            |                       |                         |                      |
| 17                       |                |     |             |   |        |            |                       |                         |                      |
| 18                       |                |     |             |   |        |            |                       |                         |                      |
| 19                       |                |     |             |   |        |            |                       |                         |                      |
| 20                       |                |     |             |   |        |            |                       |                         |                      |
| 21                       |                |     |             |   |        |            |                       |                         |                      |
| 22                       |                |     |             |   |        |            |                       |                         |                      |
| 23                       |                |     |             |   |        |            |                       |                         |                      |
| 24                       |                |     |             |   |        |            |                       |                         |                      |
| 25                       |                |     |             |   |        |            |                       |                         |                      |
| 26                       |                |     |             |   |        |            |                       |                         |                      |
| 27                       |                |     |             |   |        |            |                       |                         |                      |
| 28                       |                |     |             |   |        |            |                       |                         |                      |
| 29                       |                |     |             |   |        |            |                       |                         |                      |
| 30                       |                |     |             |   |        |            |                       |                         |                      |
| 31                       |                |     |             |   |        |            |                       |                         |                      |
| 32                       |                |     |             |   |        |            |                       |                         |                      |
| 33                       |                |     |             |   |        |            |                       |                         |                      |
| 34                       |                |     |             |   |        |            |                       |                         |                      |
| 35                       |                |     |             |   |        |            |                       |                         |                      |
| 36                       |                |     |             |   |        |            |                       |                         |                      |
| 37                       |                |     |             |   |        |            |                       |                         |                      |
| 38                       |                |     |             |   |        |            |                       |                         |                      |
| 39                       |                |     |             |   |        |            |                       |                         |                      |
| 40                       |                |     |             |   |        |            |                       |                         |                      |

Total Depth = 10.5 Feet

No Groundwater Encountered

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.



BORING NO: 3

PROJECT NAME: Santa Barbara Zoological Gardens

PROJECT NUMBER: VT-22503-02

BORING LOCATION: Per Plan

DRILLING DATE: 10-31-01

DRILLING METHOD: Hand Auger

DRILL: Mike's Excavating

LOGGED BY: K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|----------------------|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |                      |
| 0                        |                |     |             |   |        |            |                       |                         |                      |
| 1                        |                |     |             |   |        |            |                       |                         |                      |
| 2                        |                |     |             |   |        |            |                       |                         |                      |
| 3                        |                |     |             |   |        |            |                       |                         |                      |
| 4                        |                |     |             |   |        |            |                       |                         |                      |
| 5                        |                |     |             |   |        |            |                       |                         |                      |
| 6                        |                |     |             |   |        |            |                       |                         |                      |
| 7                        |                |     |             |   |        |            |                       |                         |                      |
| 8                        |                |     |             |   |        |            |                       |                         |                      |
| 9                        |                |     |             |   |        |            |                       |                         |                      |
| 10                       |                |     |             |   |        |            |                       |                         |                      |
| 11                       |                |     |             |   |        |            |                       |                         |                      |
| 12                       |                |     |             |   |        |            |                       |                         |                      |
| 13                       |                |     |             |   |        |            |                       |                         |                      |
| 14                       |                |     |             |   |        |            |                       |                         |                      |
| 15                       |                |     |             |   |        |            |                       |                         |                      |
| 16                       |                |     |             |   |        |            |                       |                         |                      |
| 17                       |                |     |             |   |        |            |                       |                         |                      |
| 18                       |                |     |             |   |        |            |                       |                         |                      |
| 19                       |                |     |             |   |        |            |                       |                         |                      |
| 20                       |                |     |             |   |        |            |                       |                         |                      |
| 21                       |                |     |             |   |        |            |                       |                         |                      |
| 22                       |                |     |             |   |        |            |                       |                         |                      |
| 23                       |                |     |             |   |        |            |                       |                         |                      |
| 24                       |                |     |             |   |        |            |                       |                         |                      |
| 25                       |                |     |             |   |        |            |                       |                         |                      |
| 26                       |                |     |             |   |        |            |                       |                         |                      |
| 27                       |                |     |             |   |        |            |                       |                         |                      |
| 28                       |                |     |             |   |        |            |                       |                         |                      |
| 29                       |                |     |             |   |        |            |                       |                         |                      |
| 30                       |                |     |             |   |        |            |                       |                         |                      |
| 31                       |                |     |             |   |        |            |                       |                         |                      |
| 32                       |                |     |             |   |        |            |                       |                         |                      |
| 33                       |                |     |             |   |        |            |                       |                         |                      |
| 34                       |                |     |             |   |        |            |                       |                         |                      |
| 35                       |                |     |             |   |        |            |                       |                         |                      |
| 36                       |                |     |             |   |        |            |                       |                         |                      |
| 37                       |                |     |             |   |        |            |                       |                         |                      |
| 38                       |                |     |             |   |        |            |                       |                         |                      |
| 39                       |                |     |             |   |        |            |                       |                         |                      |
| 40                       |                |     |             |   |        |            |                       |                         |                      |
| 41                       |                |     |             |   |        |            |                       |                         |                      |
| 42                       |                |     |             |   |        |            |                       |                         |                      |
| 43                       |                |     |             |   |        |            |                       |                         |                      |
| 44                       |                |     |             |   |        |            |                       |                         |                      |
| 45                       |                |     |             |   |        |            |                       |                         |                      |
| 46                       |                |     |             |   |        |            |                       |                         |                      |
| 47                       |                |     |             |   |        |            |                       |                         |                      |
| 48                       |                |     |             |   |        |            |                       |                         |                      |
| 49                       |                |     |             |   |        |            |                       |                         |                      |
| 50                       |                |     |             |   |        |            |                       |                         |                      |
| 51                       |                |     |             |   |        |            |                       |                         |                      |
| 52                       |                |     |             |   |        |            |                       |                         |                      |
| 53                       |                |     |             |   |        |            |                       |                         |                      |
| 54                       |                |     |             |   |        |            |                       |                         |                      |
| 55                       |                |     |             |   |        |            |                       |                         |                      |
| 56                       |                |     |             |   |        |            |                       |                         |                      |
| 57                       |                |     |             |   |        |            |                       |                         |                      |
| 58                       |                |     |             |   |        |            |                       |                         |                      |
| 59                       |                |     |             |   |        |            |                       |                         |                      |
| 60                       |                |     |             |   |        |            |                       |                         |                      |
| 61                       |                |     |             |   |        |            |                       |                         |                      |
| 62                       |                |     |             |   |        |            |                       |                         |                      |
| 63                       |                |     |             |   |        |            |                       |                         |                      |
| 64                       |                |     |             |   |        |            |                       |                         |                      |
| 65                       |                |     |             |   |        |            |                       |                         |                      |
| 66                       |                |     |             |   |        |            |                       |                         |                      |
| 67                       |                |     |             |   |        |            |                       |                         |                      |
| 68                       |                |     |             |   |        |            |                       |                         |                      |
| 69                       |                |     |             |   |        |            |                       |                         |                      |
| 70                       |                |     |             |   |        |            |                       |                         |                      |
| 71                       |                |     |             |   |        |            |                       |                         |                      |
| 72                       |                |     |             |   |        |            |                       |                         |                      |
| 73                       |                |     |             |   |        |            |                       |                         |                      |
| 74                       |                |     |             |   |        |            |                       |                         |                      |
| 75                       |                |     |             |   |        |            |                       |                         |                      |
| 76                       |                |     |             |   |        |            |                       |                         |                      |
| 77                       |                |     |             |   |        |            |                       |                         |                      |
| 78                       |                |     |             |   |        |            |                       |                         |                      |
| 79                       |                |     |             |   |        |            |                       |                         |                      |
| 80                       |                |     |             |   |        |            |                       |                         |                      |
| 81                       |                |     |             |   |        |            |                       |                         |                      |
| 82                       |                |     |             |   |        |            |                       |                         |                      |
| 83                       |                |     |             |   |        |            |                       |                         |                      |
| 84                       |                |     |             |   |        |            |                       |                         |                      |
| 85                       |                |     |             |   |        |            |                       |                         |                      |
| 86                       |                |     |             |   |        |            |                       |                         |                      |
| 87                       |                |     |             |   |        |            |                       |                         |                      |
| 88                       |                |     |             |   |        |            |                       |                         |                      |
| 89                       |                |     |             |   |        |            |                       |                         |                      |
| 90                       |                |     |             |   |        |            |                       |                         |                      |
| 91                       |                |     |             |   |        |            |                       |                         |                      |
| 92                       |                |     |             |   |        |            |                       |                         |                      |
| 93                       |                |     |             |   |        |            |                       |                         |                      |
| 94                       |                |     |             |   |        |            |                       |                         |                      |
| 95                       |                |     |             |   |        |            |                       |                         |                      |
| 96                       |                |     |             |   |        |            |                       |                         |                      |
| 97                       |                |     |             |   |        |            |                       |                         |                      |
| 98                       |                |     |             |   |        |            |                       |                         |                      |
| 99                       |                |     |             |   |        |            |                       |                         |                      |
| 100                      |                |     |             |   |        |            |                       |                         |                      |

Total Depth = 10.5 Feet

No Groundwater Encountered

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.

**BORING NO:** 4**PROJECT NAME:** Santa Barbara Zoological Gardens**PROJECT NUMBER:** VT-22503-02**BORING LOCATION:** Per Plan**DRILLING DATE:** 10-31-01**DRILLING METHOD:** Hand Auger**DRILL:** Mike's Excavating**LOGGED BY:** K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|----------------------|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |                      |
| 0                        |                |     |             |   |        |            |                       |                         |                      |
| 1                        |                |     |             |   |        |            |                       |                         |                      |
| 2                        |                |     |             |   |        |            |                       |                         |                      |
| 3                        |                |     |             |   |        |            |                       |                         |                      |
| 4                        |                |     |             |   |        |            |                       |                         |                      |
| 5                        |                |     |             |   |        |            |                       |                         |                      |
| 6                        |                |     |             |   |        |            |                       |                         |                      |
| 7                        |                |     |             |   |        |            |                       |                         |                      |
| 8                        |                |     |             |   |        |            |                       |                         |                      |
| 9                        |                |     |             |   |        |            |                       |                         |                      |
| 10                       |                |     |             |   |        |            |                       |                         |                      |
| 11                       |                |     |             |   |        |            |                       |                         |                      |
| 12                       |                |     |             |   |        |            |                       |                         |                      |
| 13                       |                |     |             |   |        |            |                       |                         |                      |
| 14                       |                |     |             |   |        |            |                       |                         |                      |
| 15                       |                |     |             |   |        |            |                       |                         |                      |
| 16                       |                |     |             |   |        |            |                       |                         |                      |
| 17                       |                |     |             |   |        |            |                       |                         |                      |
| 18                       |                |     |             |   |        |            |                       |                         |                      |
| 19                       |                |     |             |   |        |            |                       |                         |                      |
| 20                       |                |     |             |   |        |            |                       |                         |                      |
| 21                       |                |     |             |   |        |            |                       |                         |                      |
| 22                       |                |     |             |   |        |            |                       |                         |                      |
| 23                       |                |     |             |   |        |            |                       |                         |                      |
| 24                       |                |     |             |   |        |            |                       |                         |                      |
| 25                       |                |     |             |   |        |            |                       |                         |                      |
| 26                       |                |     |             |   |        |            |                       |                         |                      |
| 27                       |                |     |             |   |        |            |                       |                         |                      |
| 28                       |                |     |             |   |        |            |                       |                         |                      |
| 29                       |                |     |             |   |        |            |                       |                         |                      |
| 30                       |                |     |             |   |        |            |                       |                         |                      |
| 31                       |                |     |             |   |        |            |                       |                         |                      |
| 32                       |                |     |             |   |        |            |                       |                         |                      |
| 33                       |                |     |             |   |        |            |                       |                         |                      |
| 34                       |                |     |             |   |        |            |                       |                         |                      |
| 35                       |                |     |             |   |        |            |                       |                         |                      |
| 36                       |                |     |             |   |        |            |                       |                         |                      |
| 37                       |                |     |             |   |        |            |                       |                         |                      |
| 38                       |                |     |             |   |        |            |                       |                         |                      |
| 39                       |                |     |             |   |        |            |                       |                         |                      |
| 40                       |                |     |             |   |        |            |                       |                         |                      |
| 41                       |                |     |             |   |        |            |                       |                         |                      |
| 42                       |                |     |             |   |        |            |                       |                         |                      |
| 43                       |                |     |             |   |        |            |                       |                         |                      |
| 44                       |                |     |             |   |        |            |                       |                         |                      |
| 45                       |                |     |             |   |        |            |                       |                         |                      |
| 46                       |                |     |             |   |        |            |                       |                         |                      |
| 47                       |                |     |             |   |        |            |                       |                         |                      |
| 48                       |                |     |             |   |        |            |                       |                         |                      |
| 49                       |                |     |             |   |        |            |                       |                         |                      |
| 50                       |                |     |             |   |        |            |                       |                         |                      |
| 51                       |                |     |             |   |        |            |                       |                         |                      |
| 52                       |                |     |             |   |        |            |                       |                         |                      |
| 53                       |                |     |             |   |        |            |                       |                         |                      |
| 54                       |                |     |             |   |        |            |                       |                         |                      |
| 55                       |                |     |             |   |        |            |                       |                         |                      |
| 56                       |                |     |             |   |        |            |                       |                         |                      |
| 57                       |                |     |             |   |        |            |                       |                         |                      |
| 58                       |                |     |             |   |        |            |                       |                         |                      |
| 59                       |                |     |             |   |        |            |                       |                         |                      |
| 60                       |                |     |             |   |        |            |                       |                         |                      |
| 61                       |                |     |             |   |        |            |                       |                         |                      |
| 62                       |                |     |             |   |        |            |                       |                         |                      |
| 63                       |                |     |             |   |        |            |                       |                         |                      |
| 64                       |                |     |             |   |        |            |                       |                         |                      |
| 65                       |                |     |             |   |        |            |                       |                         |                      |
| 66                       |                |     |             |   |        |            |                       |                         |                      |
| 67                       |                |     |             |   |        |            |                       |                         |                      |
| 68                       |                |     |             |   |        |            |                       |                         |                      |
| 69                       |                |     |             |   |        |            |                       |                         |                      |
| 70                       |                |     |             |   |        |            |                       |                         |                      |
| 71                       |                |     |             |   |        |            |                       |                         |                      |
| 72                       |                |     |             |   |        |            |                       |                         |                      |
| 73                       |                |     |             |   |        |            |                       |                         |                      |
| 74                       |                |     |             |   |        |            |                       |                         |                      |
| 75                       |                |     |             |   |        |            |                       |                         |                      |
| 76                       |                |     |             |   |        |            |                       |                         |                      |
| 77                       |                |     |             |   |        |            |                       |                         |                      |
| 78                       |                |     |             |   |        |            |                       |                         |                      |
| 79                       |                |     |             |   |        |            |                       |                         |                      |
| 80                       |                |     |             |   |        |            |                       |                         |                      |
| 81                       |                |     |             |   |        |            |                       |                         |                      |
| 82                       |                |     |             |   |        |            |                       |                         |                      |
| 83                       |                |     |             |   |        |            |                       |                         |                      |
| 84                       |                |     |             |   |        |            |                       |                         |                      |
| 85                       |                |     |             |   |        |            |                       |                         |                      |
| 86                       |                |     |             |   |        |            |                       |                         |                      |
| 87                       |                |     |             |   |        |            |                       |                         |                      |
| 88                       |                |     |             |   |        |            |                       |                         |                      |
| 89                       |                |     |             |   |        |            |                       |                         |                      |
| 90                       |                |     |             |   |        |            |                       |                         |                      |
| 91                       |                |     |             |   |        |            |                       |                         |                      |
| 92                       |                |     |             |   |        |            |                       |                         |                      |
| 93                       |                |     |             |   |        |            |                       |                         |                      |
| 94                       |                |     |             |   |        |            |                       |                         |                      |
| 95                       |                |     |             |   |        |            |                       |                         |                      |
| 96                       |                |     |             |   |        |            |                       |                         |                      |
| 97                       |                |     |             |   |        |            |                       |                         |                      |
| 98                       |                |     |             |   |        |            |                       |                         |                      |
| 99                       |                |     |             |   |        |            |                       |                         |                      |
| 100                      |                |     |             |   |        |            |                       |                         |                      |

Total Depth = 10.5 Feet

No Groundwater Encountered

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.



**BORING NO:** 5

PROJECT NAME: Santa Barbara Zoological Gardens

PROJECT NUMBER: VT-22503-02

**BORING LOCATION:** Per Plan

DRILLING DATE: 10-31-01

**DRILLING METHOD:** Hand Auger

**DRILL: Mike's Excavating**

LOGGED BY: K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS  |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|---|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |   |
| 0                        |                |     |             |   |        |            |                       |                         |   |
| 1                        |                |     |             |   |        | SM         | 93.9                  | 12.7                    | Slightly silty fine sand, loose to medium dense, dusky yellowish brown (fill).                      |
| 2                        |                |     |             |   |        | SM         | 79.7                  | 13.2                    | Same as above (fill).   |
| 5                        |                |     |             |   |        | SM         | 95.0                  | 15.0                    | Slightly clayey silty fine sand with trace gravel, medium dense to dense, moderate yellowish brown. |
| 10                       |                |     |             |   |        | ML         | 100.3                 | 17.7                    | Slightly fine sandy silt, medium dense, moderate yellowish brown.                                   |
| 15                       |                |     |             |   |        |            |                       |                         | Total Depth = 10.5 Feet<br><br>No Groundwater Encountered   |
| 16                       |                |     |             |   |        |            |                       |                         |   |
| 17                       |                |     |             |   |        |            |                       |                         |   |
| 18                       |                |     |             |   |        |            |                       |                         |   |
| 19                       |                |     |             |   |        |            |                       |                         |   |
| 20                       |                |     |             |   |        |            |                       |                         |   |
| 21                       |                |     |             |   |        |            |                       |                         |   |
| 22                       |                |     |             |   |        |            |                       |                         |   |
| 23                       |                |     |             |   |        |            |                       |                         |   |
| 24                       |                |     |             |   |        |            |                       |                         |   |
| 25                       |                |     |             |   |        |            |                       |                         |   |
| 26                       |                |     |             |   |        |            |                       |                         |   |
| 27                       |                |     |             |   |        |            |                       |                         |   |
| 28                       |                |     |             |   |        |            |                       |                         |   |
| 29                       |                |     |             |   |        |            |                       |                         |   |
| 30                       |                |     |             |   |        |            |                       |                         |   |
| 35                       |                |     |             |   |        |            |                       |                         |   |
| 40                       |                |     |             |   |        |            |                       |                         |   |

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.

**BORING NO:** 6**PROJECT NAME:** Santa Barbara Zoological Gardens**PROJECT NUMBER:** VT-22503-02**BORING LOCATION:** Per Plan**DRILLING DATE:** 10-31-01**DRILLING METHOD:** Hand Auger**DRILL:** Mike's Excavating**LOGGED BY:** K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS  |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|---|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |   |
| 0                        |                |     |             |   |        |            |                       |                         |   |
| 1                        |                |     |             |   |        | SM         | 112.0                 | 13.3                    | Slightly silty fine sand, medium dense, dusky yellowish brown (fill).                   |
| 2                        |                |     |             |   |        | SM         | 114.4                 | 14.8                    | Same as above (fill).   |
| 3                        |                |     |             |   |        | SM         | 105.0                 | 16.9                    | Slightly clayey silty fine sand with trace gravel, medium dense, dusky yellowish brown. |
| 4                        |                |     |             |   |        |            |                       |                         |   |
| 5                        |                |     |             |   |        |            |                       |                         |   |
| 6                        |                |     |             |   |        |            |                       |                         |   |
| 7                        |                |     |             |   |        |            |                       |                         |   |
| 8                        |                |     |             |   |        |            |                       |                         |   |
| 9                        |                |     |             |   |        |            |                       |                         |   |
| 10                       |                |     |             |   |        | SM         | 113.5                 | 13.9                    | Slightly clayey slightly fine sandy silt, medium dense, moderate yellowish brown.       |
| 11                       |                |     |             |   |        |            |                       |                         |   |
| 12                       |                |     |             |   |        |            |                       |                         |   |
| 13                       |                |     |             |   |        |            |                       |                         |   |
| 14                       |                |     |             |   |        |            |                       |                         |   |
| 15                       |                |     |             |   |        |            |                       |                         |   |
| 16                       |                |     |             |   |        |            |                       |                         |   |
| 17                       |                |     |             |   |        |            |                       |                         |   |
| 18                       |                |     |             |   |        |            |                       |                         |   |
| 19                       |                |     |             |   |        |            |                       |                         |   |
| 20                       |                |     |             |   |        |            |                       |                         |   |
| 21                       |                |     |             |   |        |            |                       |                         |   |
| 22                       |                |     |             |   |        |            |                       |                         |   |
| 23                       |                |     |             |   |        |            |                       |                         |   |
| 24                       |                |     |             |   |        |            |                       |                         |   |
| 25                       |                |     |             |   |        |            |                       |                         |   |
| 26                       |                |     |             |   |        |            |                       |                         |   |
| 27                       |                |     |             |   |        |            |                       |                         |   |
| 28                       |                |     |             |   |        |            |                       |                         |   |
| 29                       |                |     |             |   |        |            |                       |                         |   |
| 30                       |                |     |             |   |        |            |                       |                         |   |
| 31                       |                |     |             |   |        |            |                       |                         |   |
| 32                       |                |     |             |   |        |            |                       |                         |   |
| 33                       |                |     |             |   |        |            |                       |                         |   |
| 34                       |                |     |             |   |        |            |                       |                         |   |
| 35                       |                |     |             |   |        |            |                       |                         |   |
| 36                       |                |     |             |   |        |            |                       |                         |   |
| 37                       |                |     |             |   |        |            |                       |                         |   |
| 38                       |                |     |             |   |        |            |                       |                         |   |
| 39                       |                |     |             |   |        |            |                       |                         |   |
| 40                       |                |     |             |   |        |            |                       |                         |   |
| 41                       |                |     |             |   |        |            |                       |                         |   |
| 42                       |                |     |             |   |        |            |                       |                         |   |
| 43                       |                |     |             |   |        |            |                       |                         |   |
| 44                       |                |     |             |   |        |            |                       |                         |   |
| 45                       |                |     |             |   |        |            |                       |                         |   |
| 46                       |                |     |             |   |        |            |                       |                         |   |
| 47                       |                |     |             |   |        |            |                       |                         |   |
| 48                       |                |     |             |   |        |            |                       |                         |   |
| 49                       |                |     |             |   |        |            |                       |                         |   |
| 50                       |                |     |             |   |        |            |                       |                         |   |
| 51                       |                |     |             |   |        |            |                       |                         |   |
| 52                       |                |     |             |   |        |            |                       |                         |   |
| 53                       |                |     |             |   |        |            |                       |                         |   |
| 54                       |                |     |             |   |        |            |                       |                         |   |
| 55                       |                |     |             |   |        |            |                       |                         |   |
| 56                       |                |     |             |   |        |            |                       |                         |   |
| 57                       |                |     |             |   |        |            |                       |                         |   |
| 58                       |                |     |             |   |        |            |                       |                         |   |
| 59                       |                |     |             |   |        |            |                       |                         |   |
| 60                       |                |     |             |   |        |            |                       |                         |   |
| 61                       |                |     |             |   |        |            |                       |                         |   |
| 62                       |                |     |             |   |        |            |                       |                         |   |
| 63                       |                |     |             |   |        |            |                       |                         |   |
| 64                       |                |     |             |   |        |            |                       |                         |   |
| 65                       |                |     |             |   |        |            |                       |                         |   |
| 66                       |                |     |             |   |        |            |                       |                         |   |
| 67                       |                |     |             |   |        |            |                       |                         |   |
| 68                       |                |     |             |   |        |            |                       |                         |   |
| 69                       |                |     |             |   |        |            |                       |                         |   |
| 70                       |                |     |             |   |        |            |                       |                         |   |
| 71                       |                |     |             |   |        |            |                       |                         |   |
| 72                       |                |     |             |   |        |            |                       |                         |   |
| 73                       |                |     |             |   |        |            |                       |                         |   |
| 74                       |                |     |             |   |        |            |                       |                         |   |
| 75                       |                |     |             |   |        |            |                       |                         |   |
| 76                       |                |     |             |   |        |            |                       |                         |   |
| 77                       |                |     |             |   |        |            |                       |                         |   |
| 78                       |                |     |             |   |        |            |                       |                         |   |
| 79                       |                |     |             |   |        |            |                       |                         |   |
| 80                       |                |     |             |   |        |            |                       |                         |   |
| 81                       |                |     |             |   |        |            |                       |                         |   |
| 82                       |                |     |             |   |        |            |                       |                         |   |
| 83                       |                |     |             |   |        |            |                       |                         |   |
| 84                       |                |     |             |   |        |            |                       |                         |   |
| 85                       |                |     |             |   |        |            |                       |                         |   |
| 86                       |                |     |             |   |        |            |                       |                         |   |
| 87                       |                |     |             |   |        |            |                       |                         |   |
| 88                       |                |     |             |   |        |            |                       |                         |   |
| 89                       |                |     |             |   |        |            |                       |                         |   |
| 90                       |                |     |             |   |        |            |                       |                         |   |
| 91                       |                |     |             |   |        |            |                       |                         |   |
| 92                       |                |     |             |   |        |            |                       |                         |   |
| 93                       |                |     |             |   |        |            |                       |                         |   |
| 94                       |                |     |             |   |        |            |                       |                         |   |
| 95                       |                |     |             |   |        |            |                       |                         |   |
| 96                       |                |     |             |   |        |            |                       |                         |   |
| 97                       |                |     |             |   |        |            |                       |                         |   |
| 98                       |                |     |             |   |        |            |                       |                         |   |
| 99                       |                |     |             |   |        |            |                       |                         |   |
| 100                      |                |     |             |   |        |            |                       |                         |   |

Total Depth = 10.5 Feet

No Groundwater Encountered

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.



BORING NO: 7

PROJECT NAME: Santa Barbara Zoological Gardens

PROJECT NUMBER: VT-22503-02

BORING LOCATION: Per Plan

DRILLING DATE: 10-31-01

DRILLING METHOD: Hand Auger

DRILL: Mike's Excavating

LOGGED BY: K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|----------------------|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |                      |
| 0                        |                |     |             |   |        |            |                       |                         |                      |
| 1                        |                |     |             |   |        |            |                       |                         |                      |
| 2                        |                |     |             |   |        |            |                       |                         |                      |
| 3                        |                |     |             |   |        |            |                       |                         |                      |
| 4                        |                |     |             |   |        |            |                       |                         |                      |
| 5                        |                |     |             |   |        |            |                       |                         |                      |
| 6                        |                |     |             |   |        |            |                       |                         |                      |
| 7                        |                |     |             |   |        |            |                       |                         |                      |
| 8                        |                |     |             |   |        |            |                       |                         |                      |
| 9                        |                |     |             |   |        |            |                       |                         |                      |
| 10                       |                |     |             |   |        |            |                       |                         |                      |
| 11                       |                |     |             |   |        |            |                       |                         |                      |
| 12                       |                |     |             |   |        |            |                       |                         |                      |
| 13                       |                |     |             |   |        |            |                       |                         |                      |
| 14                       |                |     |             |   |        |            |                       |                         |                      |
| 15                       |                |     |             |   |        |            |                       |                         |                      |
| 16                       |                |     |             |   |        |            |                       |                         |                      |
| 17                       |                |     |             |   |        |            |                       |                         |                      |
| 18                       |                |     |             |   |        |            |                       |                         |                      |
| 19                       |                |     |             |   |        |            |                       |                         |                      |
| 20                       |                |     |             |   |        |            |                       |                         |                      |
| 21                       |                |     |             |   |        |            |                       |                         |                      |
| 22                       |                |     |             |   |        |            |                       |                         |                      |
| 23                       |                |     |             |   |        |            |                       |                         |                      |
| 24                       |                |     |             |   |        |            |                       |                         |                      |
| 25                       |                |     |             |   |        |            |                       |                         |                      |
| 26                       |                |     |             |   |        |            |                       |                         |                      |
| 27                       |                |     |             |   |        |            |                       |                         |                      |
| 28                       |                |     |             |   |        |            |                       |                         |                      |
| 29                       |                |     |             |   |        |            |                       |                         |                      |
| 30                       |                |     |             |   |        |            |                       |                         |                      |
| 31                       |                |     |             |   |        |            |                       |                         |                      |
| 32                       |                |     |             |   |        |            |                       |                         |                      |
| 33                       |                |     |             |   |        |            |                       |                         |                      |
| 34                       |                |     |             |   |        |            |                       |                         |                      |
| 35                       |                |     |             |   |        |            |                       |                         |                      |
| 36                       |                |     |             |   |        |            |                       |                         |                      |
| 37                       |                |     |             |   |        |            |                       |                         |                      |
| 38                       |                |     |             |   |        |            |                       |                         |                      |
| 39                       |                |     |             |   |        |            |                       |                         |                      |
| 40                       |                |     |             |   |        |            |                       |                         |                      |
| 41                       |                |     |             |   |        |            |                       |                         |                      |
| 42                       |                |     |             |   |        |            |                       |                         |                      |
| 43                       |                |     |             |   |        |            |                       |                         |                      |
| 44                       |                |     |             |   |        |            |                       |                         |                      |
| 45                       |                |     |             |   |        |            |                       |                         |                      |
| 46                       |                |     |             |   |        |            |                       |                         |                      |
| 47                       |                |     |             |   |        |            |                       |                         |                      |
| 48                       |                |     |             |   |        |            |                       |                         |                      |
| 49                       |                |     |             |   |        |            |                       |                         |                      |
| 50                       |                |     |             |   |        |            |                       |                         |                      |
| 51                       |                |     |             |   |        |            |                       |                         |                      |
| 52                       |                |     |             |   |        |            |                       |                         |                      |
| 53                       |                |     |             |   |        |            |                       |                         |                      |
| 54                       |                |     |             |   |        |            |                       |                         |                      |
| 55                       |                |     |             |   |        |            |                       |                         |                      |
| 56                       |                |     |             |   |        |            |                       |                         |                      |
| 57                       |                |     |             |   |        |            |                       |                         |                      |
| 58                       |                |     |             |   |        |            |                       |                         |                      |
| 59                       |                |     |             |   |        |            |                       |                         |                      |
| 60                       |                |     |             |   |        |            |                       |                         |                      |
| 61                       |                |     |             |   |        |            |                       |                         |                      |
| 62                       |                |     |             |   |        |            |                       |                         |                      |
| 63                       |                |     |             |   |        |            |                       |                         |                      |
| 64                       |                |     |             |   |        |            |                       |                         |                      |
| 65                       |                |     |             |   |        |            |                       |                         |                      |
| 66                       |                |     |             |   |        |            |                       |                         |                      |
| 67                       |                |     |             |   |        |            |                       |                         |                      |
| 68                       |                |     |             |   |        |            |                       |                         |                      |
| 69                       |                |     |             |   |        |            |                       |                         |                      |
| 70                       |                |     |             |   |        |            |                       |                         |                      |
| 71                       |                |     |             |   |        |            |                       |                         |                      |
| 72                       |                |     |             |   |        |            |                       |                         |                      |
| 73                       |                |     |             |   |        |            |                       |                         |                      |
| 74                       |                |     |             |   |        |            |                       |                         |                      |
| 75                       |                |     |             |   |        |            |                       |                         |                      |
| 76                       |                |     |             |   |        |            |                       |                         |                      |
| 77                       |                |     |             |   |        |            |                       |                         |                      |
| 78                       |                |     |             |   |        |            |                       |                         |                      |
| 79                       |                |     |             |   |        |            |                       |                         |                      |
| 80                       |                |     |             |   |        |            |                       |                         |                      |
| 81                       |                |     |             |   |        |            |                       |                         |                      |
| 82                       |                |     |             |   |        |            |                       |                         |                      |
| 83                       |                |     |             |   |        |            |                       |                         |                      |
| 84                       |                |     |             |   |        |            |                       |                         |                      |
| 85                       |                |     |             |   |        |            |                       |                         |                      |
| 86                       |                |     |             |   |        |            |                       |                         |                      |
| 87                       |                |     |             |   |        |            |                       |                         |                      |
| 88                       |                |     |             |   |        |            |                       |                         |                      |
| 89                       |                |     |             |   |        |            |                       |                         |                      |
| 90                       |                |     |             |   |        |            |                       |                         |                      |
| 91                       |                |     |             |   |        |            |                       |                         |                      |
| 92                       |                |     |             |   |        |            |                       |                         |                      |
| 93                       |                |     |             |   |        |            |                       |                         |                      |
| 94                       |                |     |             |   |        |            |                       |                         |                      |
| 95                       |                |     |             |   |        |            |                       |                         |                      |
| 96                       |                |     |             |   |        |            |                       |                         |                      |
| 97                       |                |     |             |   |        |            |                       |                         |                      |
| 98                       |                |     |             |   |        |            |                       |                         |                      |
| 99                       |                |     |             |   |        |            |                       |                         |                      |
| 100                      |                |     |             |   |        |            |                       |                         |                      |

Total Depth = 10.5 Feet

No Groundwater Encountered

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.



**BORING NO:** 8**PROJECT NAME:** Santa Barbara Zoological Gardens**PROJECT NUMBER:** VT-22503-02**BORING LOCATION:** Per Plan**DRILLING DATE:** 10-31-01**DRILLING METHOD:** Hand Auger**DRILL:** Mike's Excavating**LOGGED BY:** K.G.

| VERTICAL<br>DEPTH (feet) | SAMPLE<br>TYPE |     |             | PENETRATION<br>RESISTANCE<br>(BLOWS/6") | SYMBOL | USCS CLASS | UNIT DRY WT.<br>(pcf) | MOISTURE<br>CONTENT (%) | DESCRIPTION OF UNITS  |
|--------------------------|----------------|-----|-------------|---|--------|------------|-----------------------|-------------------------|---|
|                          | Bulk           | SPT | Mod. Calif. |   |        |            |                       |                         |   |
| 0                        |                |     |             |   |        |            |                       |                         |   |
| 1                        |                |     |             |   |        |            |                       |                         |   |
| 2                        |                |     |             |   |        |            |                       |                         |   |
| 3                        |                |     |             |   |        | SM         | 98.0                  | 10.9                    | Slightly clayey silty fine sand with trace gravel, medium dense, dark yellowish brown (fill). |
| 4                        |                |     |             |   |        | SM         | 79.3                  | 17.9                    | Same as above.  |
| 5                        |                |     |             |   |        |            |                       |                         |   |
| 6                        |                |     |             |   |        | CL         | 100.4                 | 22.6                    | Slightly sandy slightly silty clay, stiff to hard, dusky yellowish brown.                     |
| 7                        |                |     |             |   |        |            |                       |                         |   |
| 8                        |                |     |             |   |        |            |                       |                         |   |
| 9                        |                |     |             |   |        |            |                       |                         |   |
| 10                       |                |     |             |   |        | CL         | --                    | --                      | Same as above.  |
| 11                       |                |     |             |   |        |            |                       |                         |   |
| 12                       |                |     |             |   |        |            |                       |                         |   |
| 13                       |                |     |             |   |        |            |                       |                         |   |
| 14                       |                |     |             |   |        |            |                       |                         |   |
| 15                       |                |     |             |   |        |            |                       |                         | Total Depth = 10.5 Feet   |
| 16                       |                |     |             |   |        |            |                       |                         | No Groundwater Encountered  |
| 17                       |                |     |             |   |        |            |                       |                         |   |
| 18                       |                |     |             |   |        |            |                       |                         |   |
| 19                       |                |     |             |   |        |            |                       |                         |   |
| 20                       |                |     |             |   |        |            |                       |                         |   |
| 21                       |                |     |             |   |        |            |                       |                         |   |
| 22                       |                |     |             |   |        |            |                       |                         |   |
| 23                       |                |     |             |   |        |            |                       |                         |   |
| 24                       |                |     |             |   |        |            |                       |                         |   |
| 25                       |                |     |             |   |        |            |                       |                         |   |
| 26                       |                |     |             |   |        |            |                       |                         |   |
| 27                       |                |     |             |   |        |            |                       |                         |   |
| 28                       |                |     |             |   |        |            |                       |                         |   |
| 29                       |                |     |             |   |        |            |                       |                         |   |
| 30                       |                |     |             |   |        |            |                       |                         |   |
| 31                       |                |     |             |   |        |            |                       |                         |   |
| 32                       |                |     |             |   |        |            |                       |                         |   |
| 33                       |                |     |             |   |        |            |                       |                         |   |
| 34                       |                |     |             |   |        |            |                       |                         |   |
| 35                       |                |     |             |   |        |            |                       |                         |   |
| 36                       |                |     |             |   |        |            |                       |                         |   |
| 37                       |                |     |             |   |        |            |                       |                         |   |
| 38                       |                |     |             |   |        |            |                       |                         |   |
| 39                       |                |     |             |   |        |            |                       |                         |   |
| 40                       |                |     |             |   |        |            |                       |                         |   |

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradual.



**Modified California Split Barrel Sampler**



**Modified California Split Barrel Sampler - No Recovery**



**Standard Penetration Test (SPT) Sampler**



**Standard Penetration Test (SPT) Sampler - No Recovery**



**Perched Water Level**



**Water Level First Encountered**



**Water Level After Drilling**



**Pocket Penetrometer (tsf)**



**Vane Shear (ksf)**

1. The approximate locations of borings were determined by sighting and pacing from nearby prominent topographic or cultural features. Borehole elevations were estimated by interpolating between available plan contour intervals. The location and elevation of each boring should be considered accurate only to the degree implied by this method.

2. Stratification lines represent the approximate boundary between soil and/or rock types. The transition between stratigraphic units may be gradual.

3. Water level readings taken in boreholes are approximate and apply only to the time and date of drilling. Fluctuations in the level of groundwater from the time of initial measurement may occur due to variations in rainfall, tides, barometric pressure, temperature, or other factors.



**EARTH SYSTEMS SOUTHERN CALIFORNIA**

1731-A Walter Street, Ventura, California 93003  
PH: (805) 642-6727 FAX: (805) 642-1325

**Symbols  
Commonly Used  
on Boring Logs**

| MAJOR DIVISIONS   |   |  | GRAPH SYMBOL | LETTER SYMBOL | TYPICAL DESCRIPTIONS   |
|---|---|--|--------------|---------------|--|
| COARSE GRAINED SOILS<br><br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br><br>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | CLEAN GRAVELS (LITTLE OR NO FINES)               |              | GW            | WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES  |
|   |   |  |              | GP            | POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES  |
|   |   | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) |              | GM            | SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES   |
|   |   |  |              | GC            | CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES  |
|   | SAND AND SANDY SOILS<br><br>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE       | CLEAN SAND (LITTLE OR NO FINES)                  |              | SW            | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES  |
|   |   |  |              | SP            | POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES  |
|   |   | SAND WITH FINES (APPRECIABLE AMOUNT OF FINES)    |              | SM            | SILTY SANDS, SAND-SILT MIXTURES  |
|   |   |  |              | SC            | CLAYEY SANDS, SAND-CLAY MIXTURES   |
| FINE GRAINED SOILS<br><br>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE  | SILTS AND CLAYS<br><br>LIQUID LIMIT LESS THAN 50  |  |              | ML            | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
|   |   |  |              | CL            | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS                  |
|   |   |  |              | OL            | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY  |
|   | SILTS AND CLAYS<br><br>LIQUID LIMIT GREATER THAN 50                                       |  |              | MH            | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS  |
|   |   |  |              | CH            | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS  |
|   |   |  |              | OH            | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS  |
| HIGHLY ORGANIC SOILS  |   |  |              | PT            | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS  |

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.



EARTH SYSTEMS SOUTHERN CALIFORNIA

1731-A Walter Street, Ventura, California 93003  
PH: (805) 642-6727 FAX: (805) 642-1325

**Unified Soil  
Classification  
System (USCS)**



## **APPENDIX B**

**Laboratory Testing**

**Tabulated Test Results**

**Individual Test Results**

**Soil Chemistry Results**

## LABORATORY TESTING

- A. Samples were reviewed along with field logs to determine which would be analyzed further. Those chosen for laboratory analysis were considered representative of soils that would be exposed and/or used during grading, and those deemed to be within the influence of proposed structures. Test results are presented in graphic and tabular form in this Appendix.
- B. In-situ moisture content and unit dry weight for the ring samples were determined in general accordance with ASTM D 2937.
- C. The relative strength characteristics of the soils were determined from the results of direct shear tests on remolded and undisturbed samples. Specimens were placed in contact with water at least 24 hours before testing, and were then sheared under normal loads ranging from 0.5 to 2.0 kips per square foot in general accordance with ASTM D 3080.
- D. Settlement characteristics were developed from the results of one dimensional consolidation tests performed in general accordance with ASTM D 2435. The samples were typically loaded to 0.1.25 ksf, flooded with water, and then incrementally loaded to 0.25, 0.50, 1.0, 2.0, 4.0, and 8.0 ksf. The samples were allowed to consolidate under each load increment. Rebound was measured under reverse alternate loading. Compression was measured by dial gauges accurate to 0.0001 inch. Results of the consolidation tests in the form of percent consolidation versus log of pressure curves are presented in this Appendix.
- E. Expansion index tests were performed on bulk soil samples in accordance with ASTM D 4829. The samples were surcharged under 144 pounds per square foot at moisture content of near 50% saturation. The samples were then submerged in water for 24 hours and the amount of expansion was recorded with a dial indicator.
- F. Maximum density tests were performed to estimate the moisture-density relationship of typical soil materials. The tests were performed in accordance with ASTM 1557.
- G. The gradation characteristics of selected samples were made by hydrometer (in accordance with ASTM D 422) and sieve analysis procedures. Selected samples were soaked in water until individual soil particles were separated and then washed on the No. 200 mesh sieve, oven dried, weighed to calculate the percent passing the No. 200 sieve and then mechanically sieved. Additionally, hydrometer analyses were performed to assess the distribution of the minus No. 200 mesh material of selected samples. The hydrometer test was run using sodium hexametaphosphate as a dispersing agent.

- H. Concrete and metal corrosion potential of the near surface soil was determined by measuring pH, resistivity, and soluble sulfate and soluble chloride contents. The tests were performed by Capco.

### TABULATED TEST RESULTS

#### REMOLDED SAMPLES

| BORING AND DEPTH            | B-1 @ 0-5' | B-5 @ 1-5' |
|-----------------------------|------------|------------|
| USCS                        | SM/ML      | SM         |
| MAXIMUM DENSITY (pcf)       | 122        | 127.5      |
| OPTIMUM MOISTURE (%)        | 11.5       | 9          |
| COHESION (psf)              | 70         | 0          |
| ANGLE OF INTERNAL FRICTION  | 22         | 35         |
| EXPANSION INDEX             | 69         | 0          |
| GRAIN SIZE DISTRIBUTION (%) |            |            |
| GRAVEL                      | 1.2        | 0          |
| SAND                        | 48.7       | 60.0       |
| SILT                        | 27.2       | 29.7       |
| CLAY                        | 22.9       | 10.3       |
| BORING AND DEPTH            | B-7 @ 0-5' |            |
| USCS                        | SC         |            |
| MAXIMUM DENSITY (pcf)       | 125.5      |            |
| OPTIMUM MOISTURE (%)        | 9          |            |
| COHESION (psf)              | 160        |            |
| ANGLE OF INTERNAL FRICTION  | 17         |            |
| EXPANSION INDEX             | 70         |            |
| GRAIN SIZE DISTRIBUTION (%) |            |            |
| GRAVEL                      | 13.0       |            |
| SAND                        | 39.6       |            |
| SILT                        | 21.8       |            |
| CLAY                        | 25.6       |            |

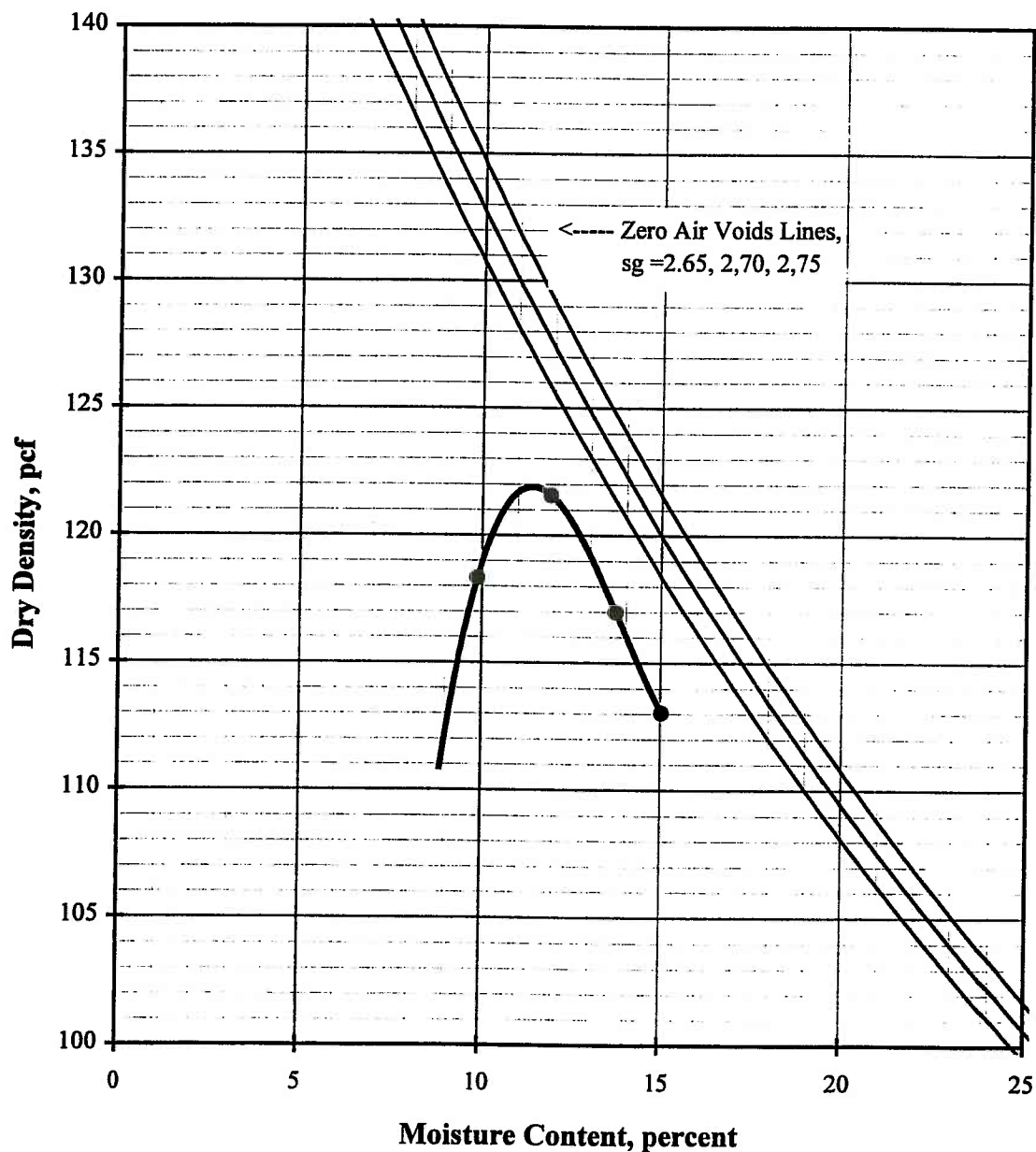
**MAXIMUM DENSITY / OPTIMUM MOISTURE**

ASTM D 1557-91 (Modified)

Job Name: Santa Barbara Zoo  
Sample ID: 1 @ 0 - 5  
Location:  
Description: Silty Sand

Procedure Used: A  
Prep. Method: Moist  
Rammer Type: Manual

|                   |         | Sieve Size | % Retained |
|-------------------|---------|------------|------------|
| Maximum Density:  | 122 pcf | 3/4"       | 0.0        |
| Optimum Moisture: | 11.5%   | 3/8"       | 0.0        |
|                   |         | #4         | 0.0        |





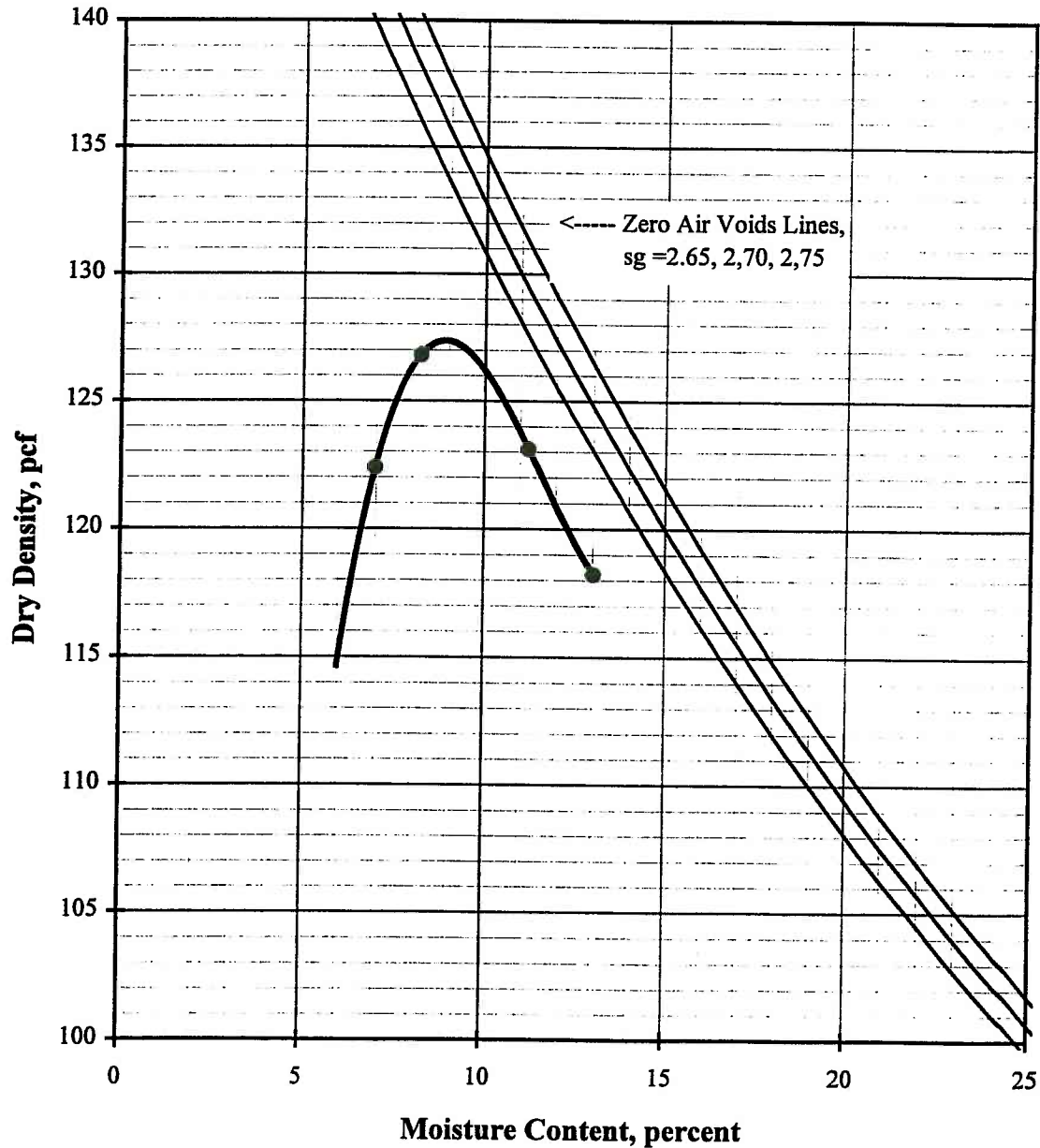
**MAXIMUM DENSITY / OPTIMUM MOISTURE**

ASTM D 1557-91 (Modified)

Job Name: Santa Barbara Zoo  
Sample ID: 5 @ 1 - 5  
Location:  
Description: Silty Sand

Procedure Used: A  
Prep. Method: Moist  
Rammer Type: Manual

|                          |                  |                              |     |
|--------------------------|------------------|------------------------------|-----|
|                          |                  | <u>Sieve Size % Retained</u> |     |
| <b>Maximum Density:</b>  | <b>127.5 pcf</b> | 3/4"                         | 0.0 |
| <b>Optimum Moisture:</b> | <b>9%</b>        | 3/8"                         | 0.0 |
|                          |                  | #4                           | 0.0 |



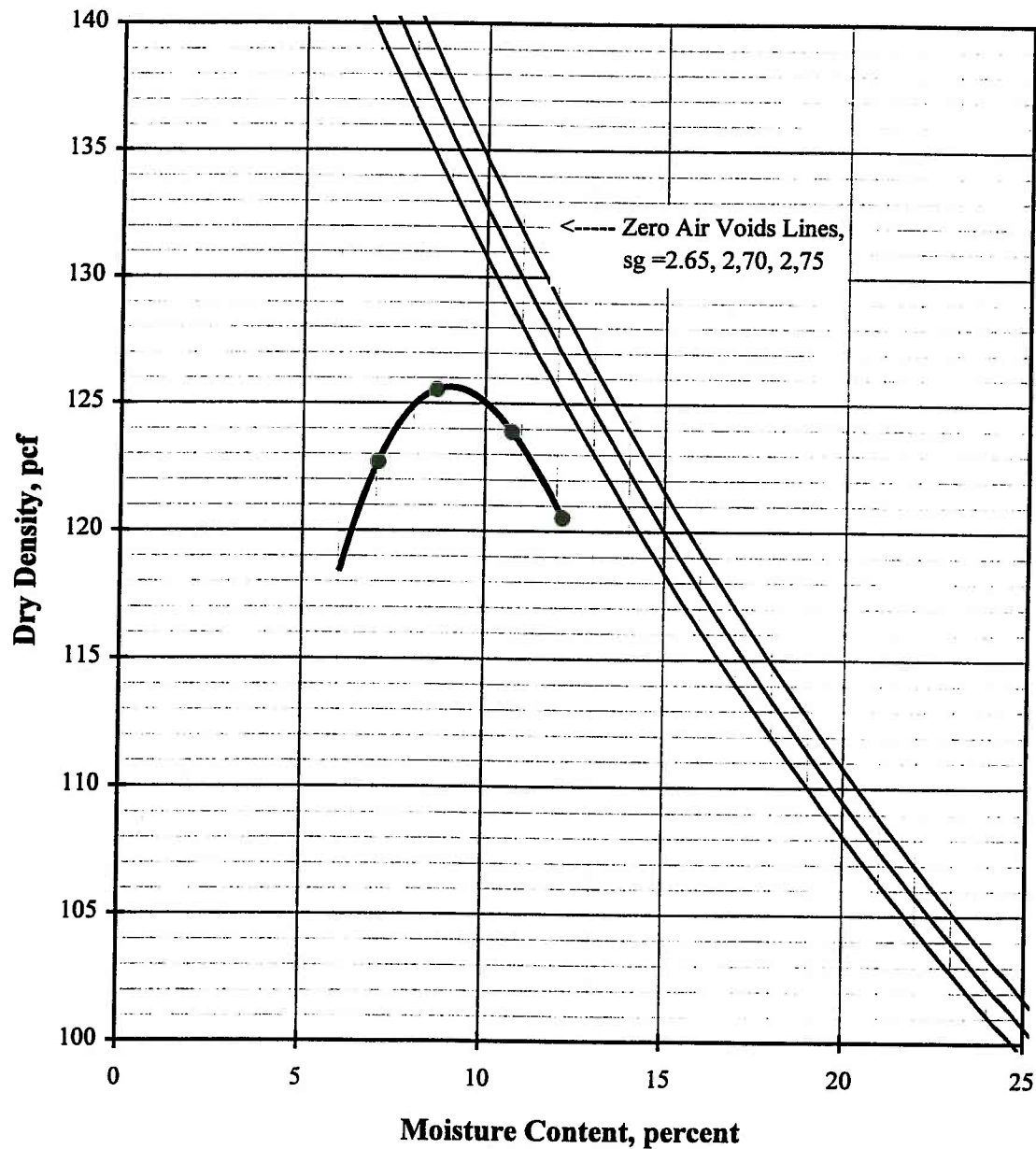
**MAXIMUM DENSITY / OPTIMUM MOISTURE**

ASTM D 1557-91 (Modified)

Job Name: Santa Barbara Zoo  
Sample ID: 7 @ 0 - 5  
Location:  
Description: Clayey Sand

Procedure Used: A  
Prep. Method: Moist  
Rammer Type: Manual

|  |                  |                   |                   |
|--|------------------|-------------------|-------------------|
| <b>Maximum Density:</b>                    | <b>125.5 pcf</b> | <b>Sieve Size</b> | <b>% Retained</b> |
| <b>Optimum Moisture:</b>                   | <b>9%</b>        | 3/4"              | 0.0               |
| <b>Corrected for Oversize (ASTM D4718)</b> |                  | 3/8"              | 0.0               |
|  |                  | #4                | 10.0              |



**DIRECT SHEAR**

080-90 (modified for unconsolidated, undrained conditions)

Santa Barbara Zoo

Initial Dry Density: 109.1 pcf

1 @ 0 - 5

Initial Moisture Content: 11.8 %

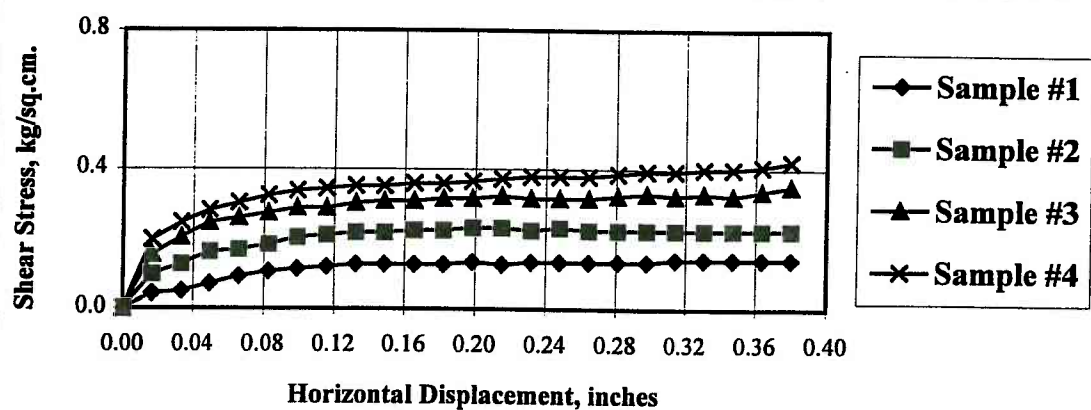
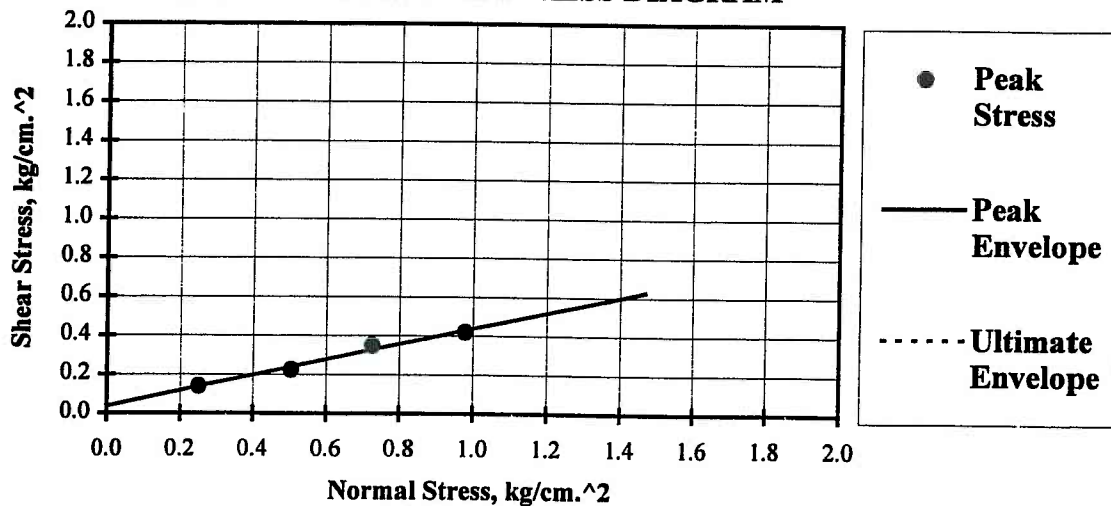
Silty Sand

Peak Friction Angle ( $\phi$ ): 22°

Remolded

Cohesion (c): 0.037 kg/cm<sup>2</sup> (70 psf)

| Sample No.                          | 1     | 2     | 3     | 4     | Average |
|-------------------------------------|-------|-------|-------|-------|---------|
| Initial                             |       |       |       |       |         |
| Dry Density, pcf                    | 109.3 | 109.3 | 108.9 | 108.8 | 109.1   |
| Moisture Content, %                 | 11.8  | 11.8  | 11.8  | 11.8  | 11.8    |
| Saturation, %                       | 60    | 60    | 59    | 59    | 60      |
| At Test                             |       |       |       |       |         |
| Moisture Content, %                 | 18.9  | 18.2  | 19.6  | 18.9  | 18.9    |
| Saturation, %                       | 96    | 93    | 99    | 95    | 96      |
| Normal Stress, kg/cm <sup>2</sup>   | 0.25  | 0.51  | 0.73  | 0.98  |         |
| Peak Stress, kg/cm <sup>2</sup>     | 0.14  | 0.22  | 0.35  | 0.42  |         |
| Ultimate Stress, kg/cm <sup>2</sup> | 0.14  | 0.22  | 0.35  | 0.42  |         |

**SHEAR vs. NORMAL STRESS DIAGRAM**

**DIRECT SHEAR**

080-90 (modified for unconsolidated, undrained conditions)

Santa Barbara Zoo

Initial Dry Density: 113.7 pcf

5 @ 1 - 5

Initial Moisture Content: 9.0 %

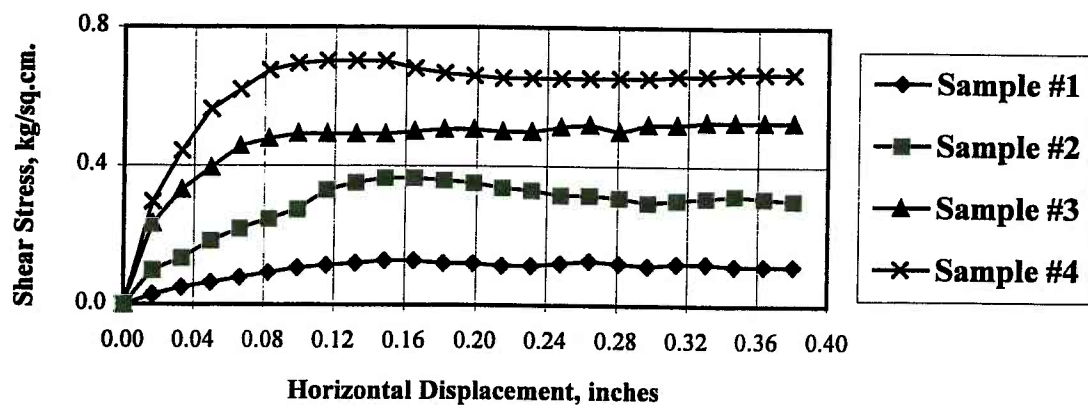
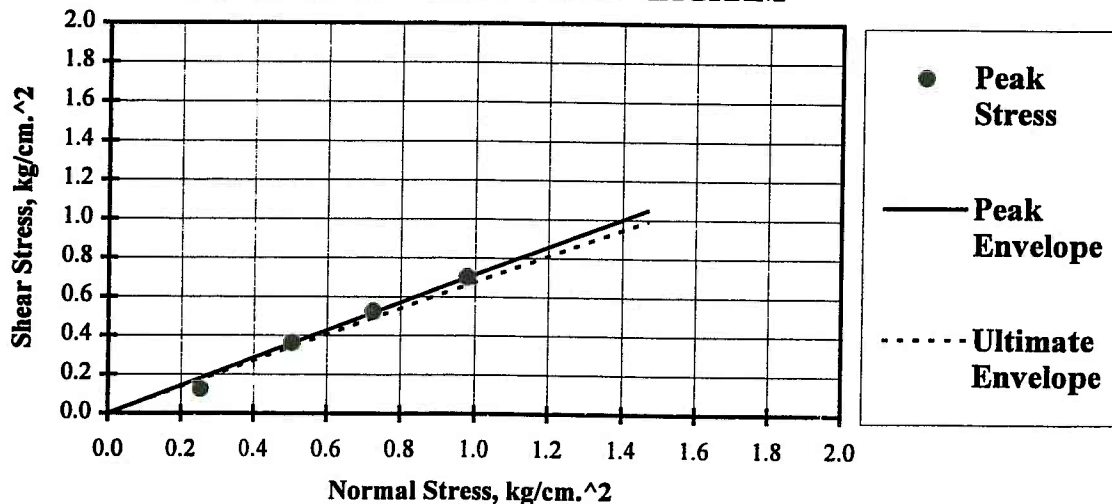
Silty Sand

Peak Friction Angle ( $\phi$ ): 35°

Remolded

Cohesion (c): 0.000 kg/cm<sup>2</sup> (0 psf)

| Sample No.                          | 1     | 2     | 3     | 4     | Average |
|-------------------------------------|-------|-------|-------|-------|---------|
| <b>Initial</b>                      |       |       |       |       |         |
| Dry Density, pcf                    | 114.1 | 113.6 | 113.6 | 113.6 | 113.7   |
| Moisture Content, %                 | 9.0   | 9.0   | 9.0   | 9.0   | 9.0     |
| Saturation, %                       | 52    | 52    | 52    | 51    | 52      |
| <b>At Test</b>                      |       |       |       |       |         |
| Moisture Content, %                 | 15.8  | 17.2  | 16.5  | 16.5  | 16.5    |
| Saturation, %                       | 92    | 98    | 95    | 94    | 95      |
| Normal Stress, kg/cm <sup>2</sup>   | 0.25  | 0.51  | 0.73  | 0.98  |         |
| Peak Stress, kg/cm <sup>2</sup>     | 0.13  | 0.37  | 0.53  | 0.70  |         |
| Ultimate Stress, kg/cm <sup>2</sup> | 0.11  | 0.31  | 0.53  | 0.67  |         |

**SHEAR vs. NORMAL STRESS DIAGRAM**



**DIRECT SHEAR**

080-90 (modified for unconsolidated, undrained conditions)

Santa Barbara Zoo

Initial Dry Density: 109.8 pcf

7 @ 0 - 5

Initial Moisture Content: 10.0 %

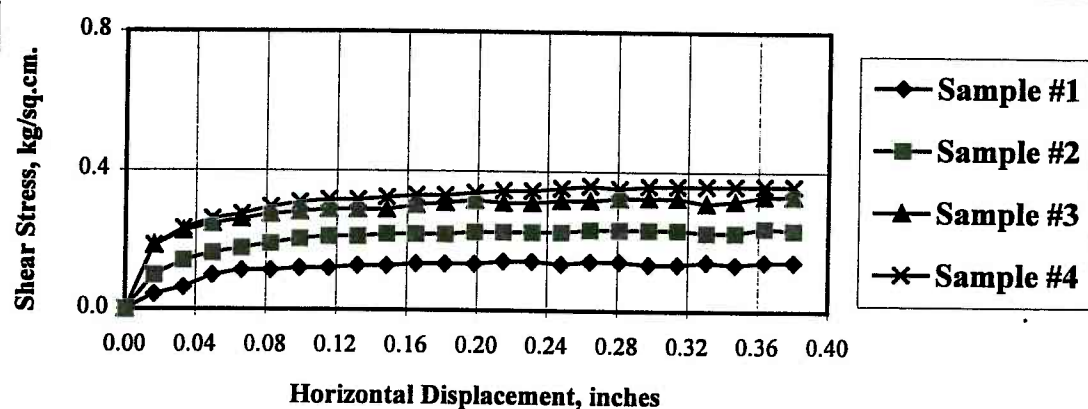
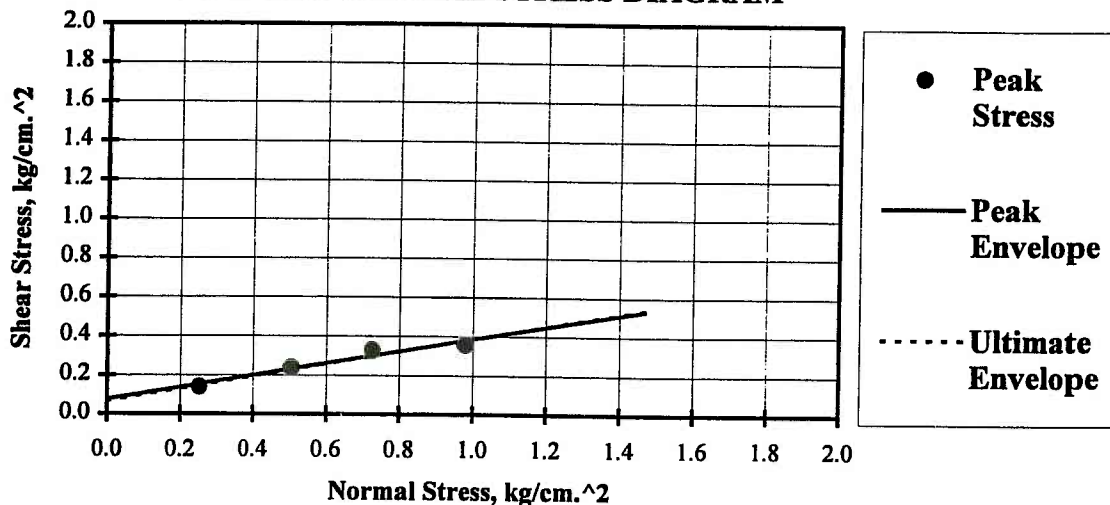
Clayey Sand

Peak Friction Angle ( $\phi$ ): 17°

Remolded

Cohesion (c): 0.076 kg/cm<sup>2</sup> (160 psf)

| Sample No.                          | 1     | 2     | 3     | 4     | Average |
|-------------------------------------|-------|-------|-------|-------|---------|
| <b>Initial</b>                      |       |       |       |       |         |
| Dry Density, pcf                    | 110.0 | 109.6 | 110.1 | 109.6 | 109.8   |
| Moisture Content, %                 | 10.0  | 10.0  | 10.0  | 10.0  | 10.0    |
| Saturation, %                       | 52    | 51    | 52    | 51    | 52      |
| <b>At Test</b>                      |       |       |       |       |         |
| Moisture Content, %                 | 17.8  | 19.2  | 18.5  | 18.5  | 18.5    |
| Saturation, %                       | 92    | 99    | 96    | 95    | 95      |
| Normal Stress, kg/cm <sup>2</sup>   | 0.25  | 0.51  | 0.73  | 0.98  |         |
| Peak Stress, kg/cm <sup>2</sup>     | 0.14  | 0.24  | 0.33  | 0.36  |         |
| Ultimate Stress, kg/cm <sup>2</sup> | 0.13  | 0.23  | 0.33  | 0.36  |         |

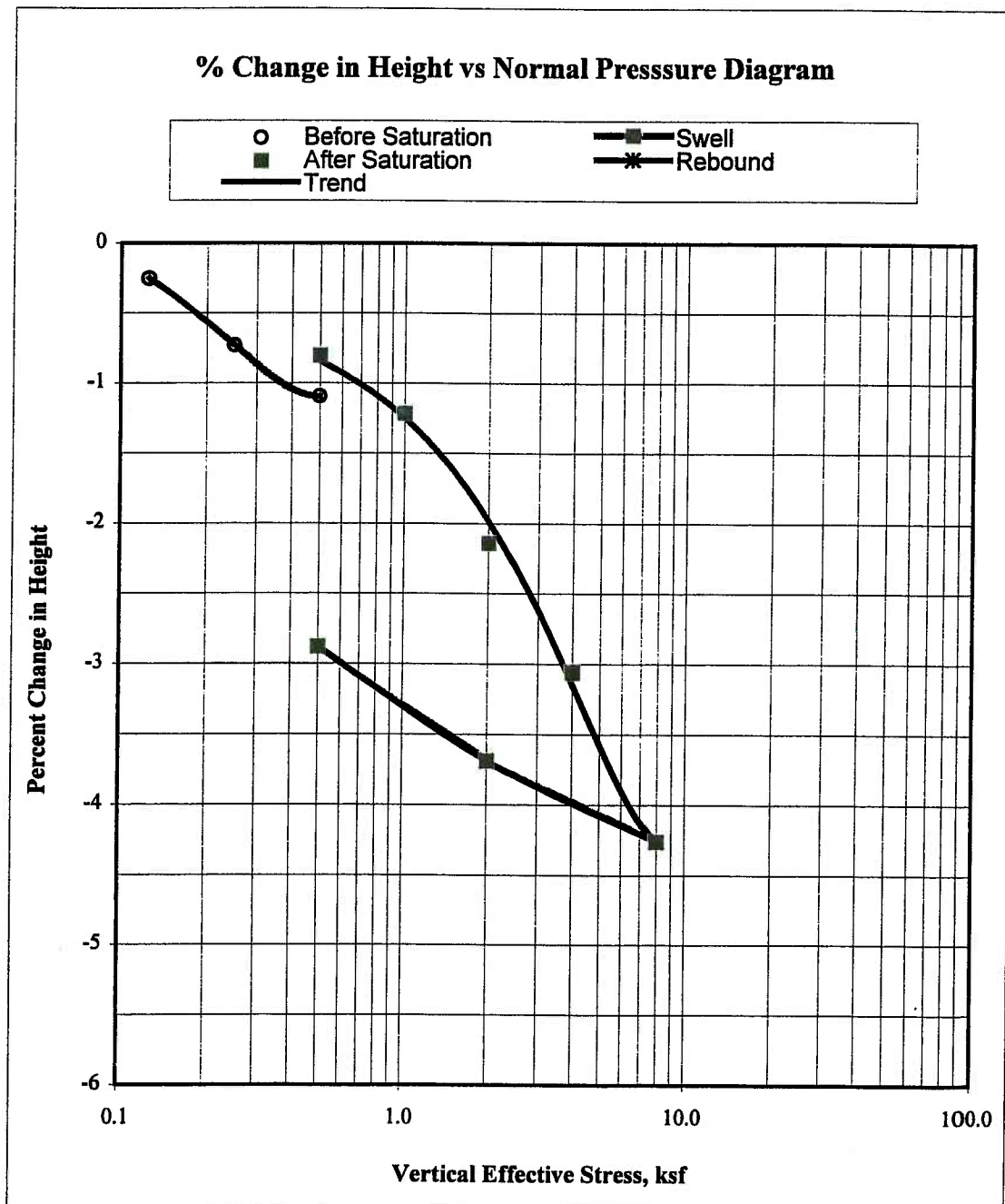
**SHEAR vs. NORMAL STRESS DIAGRAM**

**CONSOLIDATION TEST**

ASTM D 2435-90

Santa Barbara Zoo  
1 @ 5  
Sandy Silt  
Ring Sample

Initial Dry Density: 111.8 pcf  
Initial Moisture, %: 13.1%  
Specific Gravity: 2.67 (assumed)  
Initial Void Ratio: 0.491



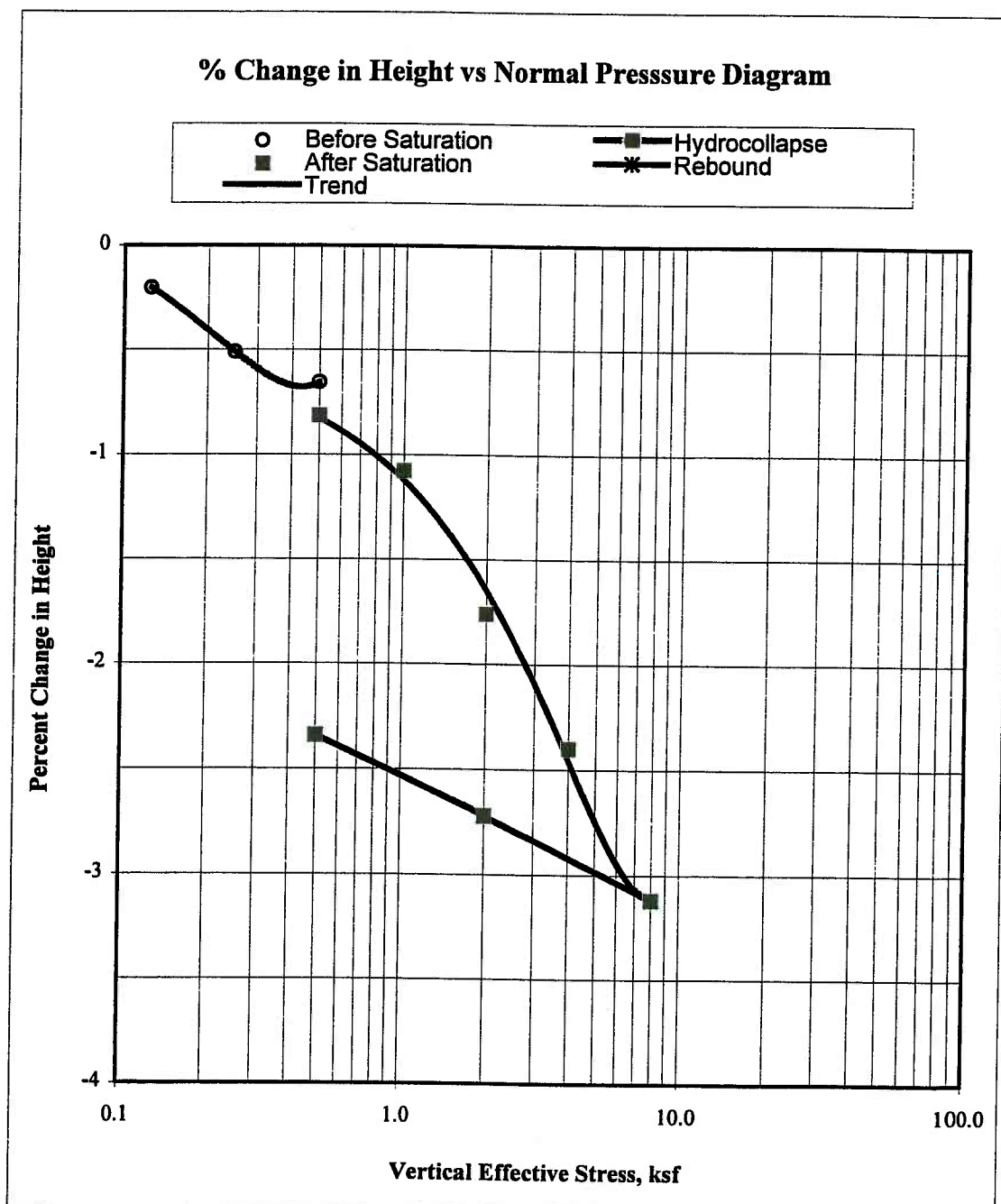
**CONSOLIDATION TEST**

ASTM D 2435-90 &amp; D5333

Santa Barbara Zoo  
3 @ 3  
Sandy Silt  
Ring Sample

Initial Dry Density: 115.7 pcf  
Initial Moisture, %: 9.1%  
Specific Gravity: 2.67 (assumed)  
Initial Void Ratio: 0.441

Hydrocollapse: 0.2% @ 0.5 ksf



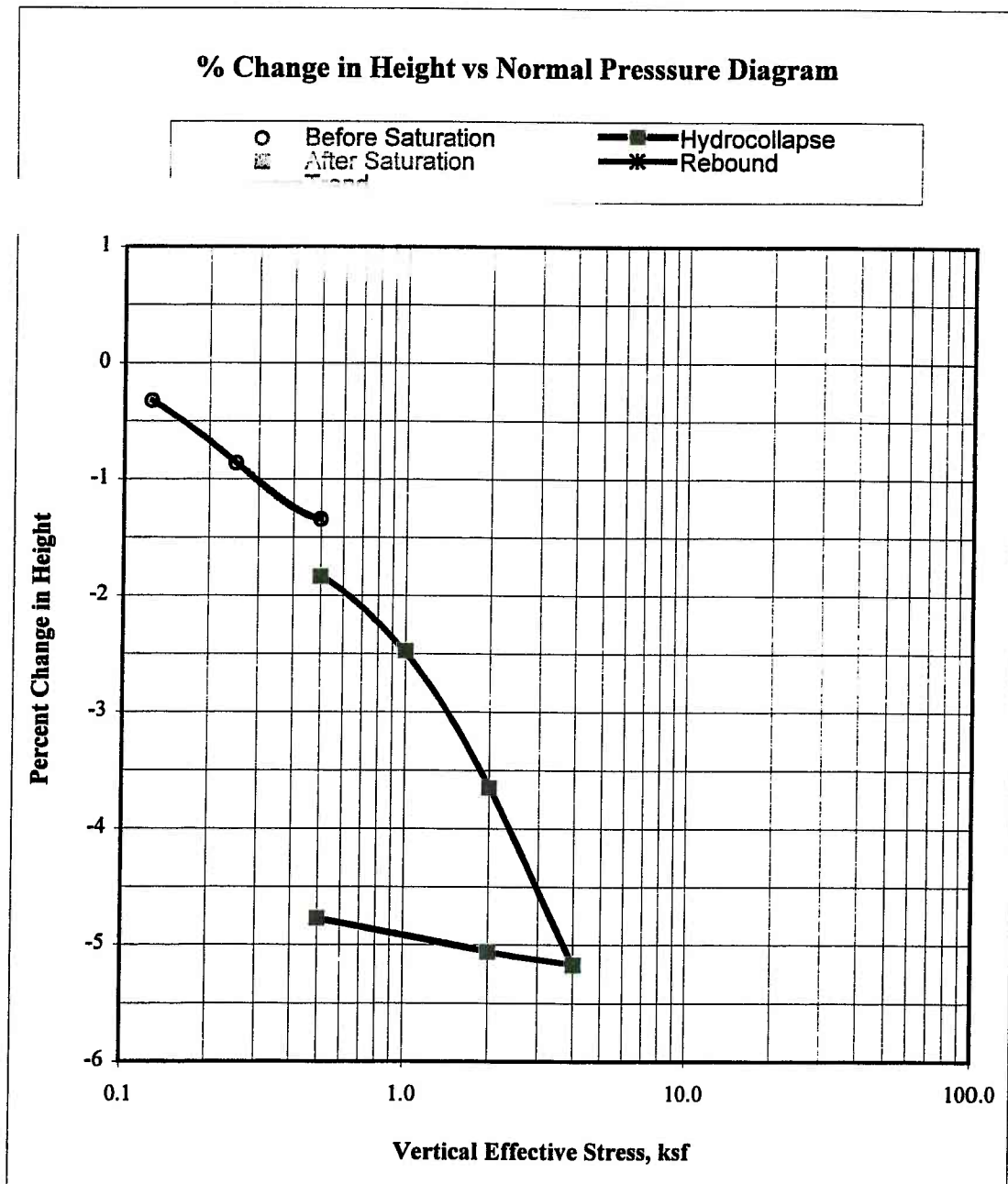
**CONSOLIDATION TEST**

ASTM D 2435-90 &amp; D5333

Santa Barbara Zoo  
6 @ 5  
Sandy Silt  
Ring Sample

Initial Dry Density: 102.8 pcf  
Initial Moisture, %: 16.9%  
Specific Gravity: 2.67 (assumed)  
Initial Void Ratio: 0.622

Hydrocollapse: 0.5% @ 0.5 ksf





Capco Analytical Services Incorporated (CAS)  
1536 Eastman Avenue, Suite B  
Ventura, CA. 93003  
(805) 644-1095

Prepared For: Earth Systems  
1731-A Walter St. Ste A  
Ventura, CA 93003

December 4, 2001

ATTENTION: Todd T.

Laboratory No: 012339  
Date Received: 14-NOV-01  
Project: Santa Barbara Zoo  
(VT-22503-02)

Job No: B05541  
Sampled By: Client  
ID: See Below

RESULTS


On November 14, 2001, three (3) samples were received for analysis by Capco Analytical Services Inc. The samples were identified and assigned the lab numbers listed below. This report consists of 4 pages excluding the cover letter, and the Chain of Custody.

SAMPLE DESCRIPTION

CAS LAB NUMBER

1 @ 0-5  
7 @ 0-5  
5 @ 1-5

01233901  
01233902  
01233903

  
Dan A. Farah, Ph.D.  
Director - Analytical Operations

This report shall not be reproduced except in full without the written approval of Capco Analytical Services Inc. The test results reported represent only the items being tested and may not represent the entire material from which the sample was taken.

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Earth Systems  
Sample ID: 1 @ 0-5  
Date Received: 11/14/01  
Date Sampled: N/A

Sample Matrix: Soil  
CAS LAB NO: 01233901

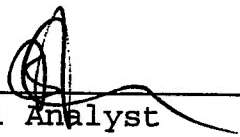
WET CHEMISTRY ANALYSIS SUMMARY

| COMPOUND     | RESULT | UNITS   | DF | PQL | METHOD      | ANALYZED |
|--------------|--------|---------|----|-----|-------------|----------|
| *Chloride    | 320    | mg/Kg   | 1  | 10  | 300.0M      | 11/14/01 |
| pH           | 8.0    | S.U.    | 1  | --- | 9045        | 11/14/01 |
| *Resistivity | 1180   | ohms-cm | 1  | 3   | CA test 424 | 11/14/01 |
| *Sulfate     | 490    | mg/Kg   | 1  | 10  | 300.0M      | 11/14/01 |

\*Sample was analyzed on a 1:10 soil/water extract. Results were reported based on the original soil sample weight.

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

  
Principal Analyst

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Earth Systems  
Sample ID: 7 @ 0-5  
Date Received: 11/14/01  
Date Sampled: N/A

Sample Matrix: Soil  
CAS LAB NO: 01233902


WET CHEMISTRY ANALYSIS SUMMARY

| COMPOUND     | RESULT | UNITS   | DF | PQL | METHOD      | ANALYZED |
|--------------|--------|---------|----|-----|-------------|----------|
| *Chloride    | 25     | mg/Kg   | 1  | 10  | 300.0M      | 11/14/01 |
| pH           | 8.1    | S.U.    | 1  | --- | 9045        | 11/14/01 |
| *Resistivity | 5466   | ohms-cm | 1  | 3   | CA test 424 | 11/14/01 |
| *Sulfate     | 30     | mg/Kg   | 1  | 10  | 300.0M      | 11/14/01 |

\*Sample was analyzed on a 1:10 soil/water extract. Results were reported based on the original soil sample weight.

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

  
Principal Analyst

Capco Analytical Services INC. (CAS)  
1536 Eastman Avenue, Suite B  
Ventura CA 93003  
(805) 644-1095

Client: Earth Systems  
Sample ID: 5 @ 1-5  
Date Received: 11/14/01  
Date Sampled: N/A

Sample Matrix: Soil  
CAS LAB NO: 01233903


WET CHEMISTRY ANALYSIS SUMMARY

| COMPOUND     | RESULT | UNITS   | DF | PQL | METHOD      | ANALYZED |
|--------------|--------|---------|----|-----|-------------|----------|
| *Chloride    | 32     | mg/Kg   | 1  | 10  | 300.0M      | 11/14/01 |
| pH           | 8.7    | S.U.    | 1  | --- | 9045        | 11/14/01 |
| *Resistivity | 8400   | ohms-cm | 1  | 3   | CA test 424 | 11/14/01 |
| *Sulfate     | 25     | mg/Kg   | 1  | 10  | 300.0M      | 11/14/01 |

\*Sample was analyzed on a 1:10 soil/water extract. Results were reported based on the original soil sample weight.

PQL: Practical Quantitation Limit

BQL: Below Practical Quantitation Limit

  
Principal Analyst



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Ventura CA 93003  
(805) 644-1095


Client: Earth Systems  
Sample ID: Method Blank

Sample Matrix: MB for Solid  
CAS LAB NO: 012339-MB

WET CHEMISTRY ANALYSIS SUMMARY

| COMPOUND | RESULT | UNITS | DF | PQL | METHOD | ANALYZED |
|----------|--------|-------|----|-----|--------|----------|
| Chloride | BQL    | mg/Kg | 1  | 10  | 300.0M | 11/14/01 |
| Sulfate  | BQL    | mg/Kg | 1  | 10  | 300.0M | 11/14/01 |

PQL: Practical Quantitation Limit  
BQL: Below Practical Quantitation Limit

  
Principal Analyst